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# EXPERIMENT STATION RECORD.

VOL. 41. JULY, 1919. No. 1.

Beginning with its second volume in 1892, the *Record* has been publishing year by year summaries of the annual acts making appropriations for the support of the Federal Department of Agriculture. These acts, authorizing expenditures for the Department's work for the ensuing fiscal year, prescribe the scope of most of its activities in considerable detail, and thus have afforded a convenient means of forecasting its program for several months to come. They have also permitted of comparisons with previous years, revealing changes in problems and policies and reflecting current public opinion as to the most urgent needs of American agriculture and the ways in which an institution like the Department can render the most effective service to the Nation.

It has seemed desirable to summarize the latest of these acts in much the same way as in previous years, although direct comparison with earlier legislation is somewhat more complicated than usual. It will be recalled that after the declaration of a state of war with Germany the regular appropriation act for the fiscal year ended June 30, 1918, was supplemented by emergency legislation, known as the Food Production Act and carrying additional appropriations of $11,346,400 for the year. The same policy as to agricultural legislation was continued the following year, what may be termed the normal activities of the Department without special reference to war conditions being provided for in an appropriation act carrying $27,875,353 for the fiscal year ended June 30, 1919, and a supplementary act passed November 21, 1918, carrying $11,031,863 for the emergency activities of the year. The latest appropriation act, however, makes provision for both the normal activities and such of those previously carried as emergency legislation as are to be continued. Mainly because of the curtailment or discontinuance of many of the emergency activities, the aggregate appropriations in the act of $33,900,211, while $6,024,858 larger than those of the previous appropriation act, in reality constitute a decrease of $5,007,005 from the amount carried in the two acts of the previous year. Comparison as regards individual items must likewise be made on the combined basis of the two acts.

An estimate of the relative resources of the Department is further complicated by the increasingly large sums of money now available to it through permanent appropriations and provisions carried in other appropriation acts. Formerly what are termed the permanent appropriations of the Department were comparatively minor sources of income, but for the present fiscal year they are estimated at $28,235,000. The largest sources are the Federal Aid Road Act, carrying $21,000,000; the Agricultural Extension Act, with $3,080,000; and the meat inspection provision, with $3,000,000.

Of the annual allotments to the Department carried in other appropriation acts, the largest specific sum is $600,000 for printing and binding. There is also an indefinite appropriation which continues the granting of a salary bonus to most of the employees of the Department, in common with other branches of the Government, the conditions under which this bonus is granted being substantially as for the previous year but with the maximum amount per employee increased from $120 to $240 per annum. In addition considerable expenditures may be made by the Department from a revolving fund derived from an appropriation of $6,500,000 for the purchase and sale of seeds. This appropriation is available until "the National emergency resulting from the existing state of war shall have passed," but not later than the beginning of the next fiscal year after the termination of the war as declared by the President. The aggregate from these various appropriations can not be definitely estimated, but it seems likely that from them and the permanent appropriations funds will be derived at least equivalent to those carried in the agricultural appropriation act itself.

For various reasons the appropriation act did not become law for several weeks after the termination of the preceding fiscal year. Following extended hearings, a bill carrying $31,691,562 was reported from the House Committee on Agriculture on January 24, 1919, and passed by the House February 1. It was reported by the Senate Committee on Agriculture and Forestry February 22, but was among the group of appropriation acts which failed of enactment prior to the adjournment of the Sixty-fifth Congress on March 4.

Upon the reassembling of the Sixty-sixth Congress, the committees were reorganized, Hon. G. N. Haugen of Iowa succeeding Hon. A. F. Lever of South Carolina as chairman of the House committee, and Hon. A. J. Gronna of North Dakota succeeding Hon. T. P. Gore of Oklahoma as chairman of the Senate committee. On May 26, the new Agricultural Committee of the House reported a bill, identical in text with that formed by its predecessor except for some twenty amendments, most of which were of a minor nature. This bill was passed by the House June 4, and after further amend-

ment, by the Senate June 27. On July 1 it was presented at the White House, but on July 11 vetoed by the President because of an amendment which had been inserted repealing the so-called Daylight-saving Law. The veto was sustained by the House, and a third bill was introduced which became a law July 24. This act was identical with the vetoed measure except for the omission of the legislation regarding daylight saving and the inclusion of a clause amending the public land laws to assist settlers driven from their holdings in 1919 by drouth. Subsequently, a joint resolution was also enacted which validated obligations incurred by the Department during the interval between July 1 and the passage of the appropriation act.

Taking up the allotments of the various bureaus and offices in turn, by far the largest increase to any bureau is accorded the Bureau of Animal Industry, whose direct allotments rise from $4,079,588 to $5,783,231. Some of this increase is in lieu of emergency allotments of $1,058,975, and the remainder is mainly for work with animal diseases and meat inspection. The usual additional appropriation of $1,000,000, plus any unexpended balance remaining from the fiscal year 1916, to combat outbreaks of foot-and-mouth disease, rinderpest, and other infectious and contagious diseases of animals is also continued and supplements the total accordingly.

The largest single item of increase for the bureau is one of $1,000,000 for payment of indemnities to owners of tuberculous animals in connection with the tuberculosis campaign, for which $1,500,000 will be available. Cooperation is now under way with about forty States in this campaign, both the "accredited-herd" and "circumscribed area" systems of control being used. A slight change is made in the phraseology of the item to permit Federal payments for animals condemned in one State but shipped elsewhere for slaughter.

The fund available for tick eradication is $741,980. The high-water mark of progress reached in 1917 was exceeded in 1918 with 79,600 square miles of territory released from quarantine, freeing the entire State of South Carolina and leaving under quarantine only 269,653 square miles. The subappropriation of $50,000 for live stock and dairy demonstration work in cooperation with the States Relations Service is continued.

The allotment for inspection and quarantine work is increased from $503,662 to $525,000 because of an outbreak of sheep scabies in the Western States. On the other hand, the fund for dourine eradication is decreased by $7,800 because of the progress obtained in the campaign against this disease. An apparent increase of $194,195 for hog cholera work is in lieu of funds derived from the emergency act.

There is an apparent increase from $308,680 to $327,680 for animal husbandry investigations, but actually a large reduction since $544,600 was carried in the emergency act. The allotment for the work of the Dairy Division, likewise somewhat curtailed, is $350,370. The special appropriations of $60,000 for experiments and demonstration with live stock production in cane-sugar and cotton districts, and $40,000 for experiments in dairying and live stock production in semiarid and irrigated districts are continued unchanged.

The supplementary fund for meat inspection is increased from $477,200 to $903,960, making with the permanent appropriation already mentioned $3,903,960 available for the purpose. Opportunity is given to increase the salaries of about 3,000 employees of the service and provision is made for over-time pay, the Government to be reimbursed for this by establishments receiving the inspection. Legislation is incorporated extending the meat inspection to equine meat and meat products, and authority is given to use $100,000 in the inspection of this commodity. The Food and Drugs Act is also amended by specifically extending its net-weight provisions to wrapped meats included in papers or other materials as prepared by manufacturers for sale.

The appropriations for the Bureau of Plant Industry aggregate $3,379,638 as compared with $3,137,038 in the previous appropriation act and $459,300 in the emergency act. The principal item to be increased is the Congressional seed distribution. This is continued under the usual plan, with an enlargement of funds from $242,320 to $358,980.

Provision is made for the establishment of a plant inspection and detention station of not to exceed fifty acres near Washington, in connection with the foreign seed and plant introduction, with an appropriation of $50,000 for the purchase of land and erection of buildings. The allotment for horticultural investigations is increased from $60,540 to $73,340, this representing a transfer of a portion of the work carried on under the emergency act to stimulate the production in the South of second-crop potatoes. The studies of nut growing and utilization are segregated with an allotment of $20,000. Authority is given to expend $20,000 of the funds for pomological work in developing new grape industries and methods of utilizing grapes heretofore used for the production of alcoholic beverages.

Several increases are made for combating plant diseases. A new item allots $50,000 for cooperation with the plant disease survey and inspection and control authorities of the States to combat flag smut of wheat, take-all, helminthosporium, and other soil and seed diseases of wheat and other cereals. Allotments of $10,000 to combat sugar beet nematodes and $20,000 for studies of the mottling dis-

ease of sugar cane discovered in Porto Rico are made in lieu of funds derived from the emergency act. An increase of $5,000 is provided for studies of diseases of orchards and other fruits. On the other hand, the funds for the eradication of citrus canker are decreased from $250,000 to $196,320 because of the completion of the campaign in Georgia and South Carolina.

Several notable increases are made in the fund for combating insect pests. The Bureau of Entomology receives $1,371,360 as compared with $986,680 in the previous act, but a portion of this increase is in lieu of $247,000 allotted the Bureau under the emergency act. The salary of the chief is increased from $4,500 to $5,000. Special allotments of $250,000 and $5,000, respectively, are made for two new pests, the European corn borer and the camphor thrip. The European corn borer, deemed the most dangerous insect pest of corn which has ever appeared in this country, is spreading very rapidly from the original point of discovery near Boston, Mass., and now occurs in dangerous numbers in an area of over 1,000 square miles. The campaign for its control is made cooperatively with the States concerned, Massachusetts having appropriated $120,000, and New York $100,000, for the purpose. Other increases are made in the allotments for studies of several other insect pests, including the sweet potato weevil, recently become a serious menace in portions of Georgia, Alabama, Mississippi, Louisiana, and Texas, the oriental fruit moth, and the Japanese beetle.

Additional provision for combating insect pests and diseases is made through the allotments to the Federal Horticultural Board, which receives $129,000, an increase of $54,200 over the previous year. This increase is mainly for the cooperative campaign against the very serious potato wart disease discovered in three counties of Pennsylvania. Legislation providing a Plant Quarantine Act for the District of Columbia was favorably recommended by both the House and Senate Committees, but eliminated in each house on a point of order.

The funds for the campaign against the pink bollworm of cotton are enlarged by $100,000, to provide for the disinfection in specially constructed fumigation sheds on the Texas-Mexican border of freight, baggage, and other materials entering the United States from Mexico. A method has been worked out under which whole trains of cars may be effectively fumigated in these sheds, the cost of materials and labor being eventually defrayed by charges against the shipments disinfected.

The appropriation for the Bureau of Biological Survey is $742,170 as compared with $586,350 plus $225,000 under the emergency act. The largest item of increase is $75,000 for the enforcement of the

Migratory Bird Treaty Act. The salary of the chief is increased from $3,500 to $4,000. The clause authorizing experiments and demonstrations in destroying wolves, coyotes, prairie dogs, and other animals injurious to agriculture and animal husbandry is amended to include gophers, and the appropriation enlarged to $164,440. An allotment of $34,600 is continued for the maintenance of the Montana National Bison Range and other game reservations, and a special appropriation of $5,000 granted to improve the game preserve in Sullys Hill National Park in North Dakota. A new item in the act authorizes the Department to transfer surplus bison to municipalities and public institutions, and for purposes of propagation to make loans or exchanges with other owners of bison.

The appropriations for the Forest Service aggregate $5,966,869, with $600,000 additional for further purchases under the Appalachian Forest Reserve Act, and $100,000 for cooperation with the States in fire protection under that act. The bulk of the appropriation is to be used in the administration, protection, and development of the National Forests, which it is of interest to note returned in receipts for the fiscal year 1918, $3,574,930.07. Considerable readjustment is made in the allotments of the individual National Forests, including an aggregate increase of $225,568 for additional fire protection. Net decreases of $11,000 and $20,000, respectively, are made in the allotments for land classification and the reconnoissance of forest resources, the former by reason of the completion of some of this work, and the latter because of difficulty in securing the necessary trained personnel.

The Bureau of Chemistry receives $1,391,571. This includes several small increases in allotments, including $50,000 additional for the enforcement of the Food and Drugs Act; $29,280 to complete the equipment of the laboratory at the Arlington Experimental Farm for color investigations; $5,000 for extending the studies with dressed poultry; and $1,000 for those with fish, but several of these allotments are in lieu of considerably larger appropriations under the emergency act. Provision is made to continue the studies of utilizing wool waste and the manufacture of sweet sirups undertaken under that act, with allotments of $9,000 and $5,000, respectively. The cooperative food dehydration studies instituted last year are definitely assigned to the bureau, with $50,000 appropriated to study and devise methods of dehydration and disseminate information as to the value and suitability of such products as food.

The aggregate appropriation for the States Relations Service is $4,905,820, this including as usual $1,440,000 for payments to the States under the Hatch and Adams Acts. In the preceding act $3,150,820 was granted the Service, but this was well-nigh tripled

by $6,100,000 from the emergency act, so that there is an actual decrease of $4,345,000. This decrease is almost entirely in the allotment for demonstration and extension work, although there is also a net reduction of $5,000 for the Office of Home Economics, which will receive $46,280. The allotment of $20,600 for the work with farmers' institutes and agricultural schools is continued unchanged.

The insular experiment stations are allotted $215,000. This is an increase of $25,000, of which $10,000 is granted to the Alaska Stations, and $5,000 each to those in Hawaii, Porto Rico, and Guam. In Alaska the increased funds will be used for the erection of cattle barns on the island of Kodiak, and the construction of a stock barn, clearing land for pasture, and purchase of breeding stock to undertake studies in dairying and pig raising at Matanuska; in Hawaii, for the further development of the demonstration and extension work; in Porto Rico, to stimulate the increased local production of many foods now largely imported from the mainland; and in Guam, to repair the ravages caused by a serious typhoon in July, 1918.

No change is made in the usual allotment of $645,040 for farmers' cooperative demonstration work within the cotton belt, while that for the corresponding work in the remainder of the country is increased from $554,800 to $751,280. As a new item, an appropriation is made of $1,500,000 for cooperative extension work to be allotted and expended under the same terms and with the same supervision as the funds derived from the Agricultural Extension Act of 1914. The funds thus provided represent an amount equivalent to that which will be available under the Extension Act at its maximum in 1922, and are to be expended in accordance with plans mutually agreed upon by the Department and the college officials.

By legislation contained elsewhere in the act, all moneys contributed for cooperative work by the Department must henceforward be paid only through the Secretary of Agriculture, or through State, county, or municipal agencies, local farm bureaus, or like organizations cooperating for the purpose with the Department. This provision was enacted because of previous legislation prohibiting after July 1, 1919, contributions to the salaries of any Government employee from non-Government sources for services performed by him for the Government. The Forest Service, however, is specifically exempted from the entire legislation on this subject.

The appropriations for the Bureau of Public Roads are continued without substantial modifications, the principal change being an increase in the salary of the chief from $4,500 to $6,000. The various lines of engineering activities are continued, including $82,440 and $73,760, respectively, for farm irrigation and drainage investigations,

and $25,000 for studies of farm water supplies, drainage disposal, farm building construction, and similar problems. The total carried by the act is $594,320, or slightly less than the $600,000 now allowed the Bureau in the Federal Aid Road Act for administrative expenses under that act.

The funds for the Bureau of Markets, consisting last year of $2,023,255 under the appropriation act and $2,004,608 under the emergency act, are reduced to $2,811,365. For general marketing and distribution studies there will be available $317,520, a net increase of $14,100 for cotton handling and marketing work. The market news service is continued with allotments of $250,000 for fruits and vegetables; $105,320 for live stock and meats; $80,600 for dairy and poultry products; $50,000 for grain, hay, feeds, and seeds; and $12,000 for peanuts. The market inspection service is extended to include poultry, butter, and hay, $150,000 being allowed for the purpose; and for investigations of the transportation, storage, preparation, marketing, manufacturing, and distribution of agricultural food products, $48,800 is granted. There is a net increase of $17,210 to extend cooperation with the States in marketing work, now under way in twenty-five States. For studies of cotton standards and marketing methods $45,920 is again allotted, and $86,050 is granted for the studies of grain handling, grading, and transportation. The allotment for studies of cooperation among farmers is decreased from $28,280 to $15,780.

Increased funds are provided to enforce the U. S. Cotton Futures and the U. S. Grain Standards Acts, the respective allotments being $131,780 and $598,600. For the enforcement of the Standard Container Act $3,800 is granted, and for the U. S. Warehouse Act $35,000. The latter act is amended in several particulars, with a view to securing its more general utilization.

A new section appropriates $35,000 to enable the bureau to complete the work of the Domestic Wool Section of the War Industries Board. There is also an appropriation of $75,000 to enforce the proclamations of the President in 1918 establishing a licensing system for the stockyards industry.

The Office of the Secretary receives $803,110. Of this, $302,590 is for the Office of Farm Management, substantially the amount carried in the preceding act for this Office. The salary of the chief is increased from $4,000 to $5,000, and a specific allotment of $23,873 is made for use in ascertaining the cost of production of the principal staple agricultural products.

The work of the remaining branches of the Department is continued on substantially the present basis, both as to funds and as to lines of work. There is a reduction from $1,912,930 to $1,880,210 for the Weather Bureau, but this is due mainly to the completion of

certain repairs to equipment and the termination of the frost protection studies in progress for several years.

The Bureau of Crop Estimates receives $371,102, in lieu of $346,232 in the previous act and $234,540 from the emergency act; the Bureau of Soils, $491,235; the Division of Accounts and Disbursements, $44,620; the Division of Publications, $240,590, an increase of $25,850; and the Library, $50,160. For the enforcement of the Insecticide Act the Department is granted $123,940; for demonstration work on reclamation projects, $48,600; and for miscellaneous expenses, $175,500. For rent of buildings in the District of Columbia $100,000 is provided, in addition to $41,509 allotted in the Sundry Civil Act. This is a reduction of $17,180 from the previous year, because of the occupancy by the Department of space in some of the temporary buildings erected by the Government for the war emergency.

A specific appropriation of $100,000 is granted to enable the Department to make exhibits at State, interstate, and international fairs. Of this amount not to exceed $25,000 may be used in connection with the National Dairy Show at Chicago, and not over $5,000 for any other one fair. The President is authorized to extend invitations to other nations to appoint delegates to the International Farm Congress at Kansas City in September, 1919, and the World Cotton Conference at New Orleans, October 13–16, 1919.

From the foregoing exposition it is hoped that a general idea of the prospective major activities of the Department during the present fiscal year may be obtained. It may be said, by way of summary, that provision has been made for most of what may be termed the routine activities of the Department; for the continuance, although in most instances on a reduced basis, of many of the projects instituted under the Food Production Act and supplementary legislation; and for notable increases in expenditures in several of the regulatory functions of the Department and in the combating of injurious insects and plant diseases. Attention should again be directed to the fact that the new appropriation act, though finally passed late in July, was originally formulated in January, and probably reflects as a whole conditions then prevailing rather than those operative today. None the less, it constitutes the first expression by Congress regarding the work of the Department since the cessation of hostilities, and in view of the universal desire for retrenchment in the enormous expenditures of the Government the action taken may well be regarded as significant of the country's appreciation of the Department and its proposed lines of development.

# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**Recent advances in organic chemistry**, A. W. STEWART (*London and New York: Longmans, Green & Co., 1918, 3. ed., pp. XIX+350; rev. in Jour. Soc. Chem. Indus., 38 (1919), No. 5, p. 95R*).—In the third edition of this book the author has adhered to the purpose of the earlier editions "to illustrate the principles upon which modern chemistry moves—not stands—and to undermine the conservatism which exists in all but strikingly original minds." The advances in organic chemistry since the last edition in 1910 have necessitated many changes and considerable additional material in the text. Among the new subjects are Willstätter's researches on chlorophyll and the anthocyanins, the recent processes for the synthesis of rubber, and certain theories bearing upon the synthesis of compounds in vegetable and animal organisms.

**Commercial oils, vegetable and animal, with special reference to oriental oils**, I. F. LAUCKS (*New York: John Wiley & Sons, Inc., 1919, pp. VIII+138*).—This book contains the technical data and information required in everyday dealings in the oil trade. Special attention has been given to the characteristics or constants of oriental oils which are now being imported at Pacific coast ports. Data on these, for the most part results of work in the author's laboratory, have been given separately from the average characteristics on account of variations in the same oil from different parts of the world.

The subject matter includes general properties of and tests for oils, descriptions with characteristics of a large number of vegetable and animal oils, a brief discussion of the uses of oils, and descriptions of various methods of sampling oils.

**The rancidity of palm kernel and other feeding cakes**, J. R. FURLONG (*Jour. Agr. Sci. [England], 9 (1919), No. 2, pp. 137–142*).—The amount of acidity developed under certain conditions in palm kernels, and in cake and meal made from them has been determined in comparison with other common feeding cakes, and the nature of the action investigated.

The results indicate that all of the feeding cakes studied contain a lipase which, under suitable conditions of moisture, acts on the fat liberating fatty acids. The degree of acidity, however, can not be taken as a measure of rancidity or as an index to the palatability of the cake. The rancidity which develops in the palm kernel and coconut cakes is thought to be due to the fact that the acids yielded on hydrolysis are the volatile acids of low molecular weight and unpleasant odor.

Contrary to the results of Calder (E. S. R., 35, p. 770), the author has found palm kernel lipase to be very resistant to heat, being capable of surviving to an appreciable extent four hours' exposure to a temperature of 97° C. in a moist state, or two hours' exposure at 120° in a dry condition. It is therefore considered impracticable to render the lipase inactive before leaving the factory, and the necessity is urged of keeping the palm kernel and other feeding cakes in a dry condition, in which state the lipase is unable to act.

**Lysin as a hydrolytic product of hordein**, C. O. Johns and A. J. Finks (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 63–66*).—Analyses of hordein by the Van Slyke method are reported from the Bureau of Chemistry, U. S. Department of Agriculture. The average distribution of nitrogen corrected for solubility of bases was as follows: Amid N 23.85 per cent, humin N absorbed by lime 0.84, humin N in amyl alcohol extract 0.28, cystin N 0.81, arginin N 5.37, histidin N 3.63, lysin N 1.01, amino N of filtrate 49.35, and nonamino N of filtrate 14.20 per cent. The basic amino acids in percentage of total protein were cystin 1.18, arginin 2.82, histidin 2.27, and lysin 0.89. These results agree quite closely with those obtained by Osborne et al. on gliadin (E. S. R., 33, p. 867), but differ considerably from the earlier analyses of hordein reported by Osborne and Clapp (E. S. R., 19, p. 611) and Kleinschmitt (E. S. R., 20, p. 907), who isolated the basic amino acids by the direct method of Kossel and found no evidence that hordein contained lysin.

**Comparative tests of palau and rhotanium ware as substitutes for platinum laboratory utensils**, L. J. Gurevich and E. Wichers (*Jour. Indus. and Engin. Chem., 11 (1919), No. 6, pp. 570–573*).—A detailed report is given of a series of tests conducted at the Bureau of Standards, U. S. Department of Commerce, to determine the suitability of "palau" and "rhotanium" (alloys of gold and palladium) as substitutes for platinum in laboratory ware.

"These tests indicate that rhotanium A ware is superior to platinum ware both of high (2.4 per cent) and low (0.6 per cent) iridium content in respect to its resistance to loss on heating. The losses on treatment with acid, after heating, are about equal. Grade A ware compares favorably with platinum in resistance to boiling hydrochloric acid, to boiling 20 per cent sodium hydroxid, and to fusion with sodium carbonate in a muffle, and with potassium pyrosulphate. It is superior to platinum in resistance to the action of boiling sulphuric acid, and inferior in its resistance toward boiling concentrated and dilute nitric acid, boiling 10 per cent ferric chlorid solution, and for fusions with sodium hydroxid. The only objection that may be raised to its use is the rather low melting point of the alloy, which makes it impossible to blast or strongly heat the ware without melting it.

"As far as resistance to loss in weight on heating to 1,200° C. is concerned, rhotanium C and palau wares are about equal, if not slightly superior, to platinum ware containing 0.6 per cent iridium. . . . Palau and rhotanium C behave toward reagents in about the same way as rhotanium A, except that they are not suitable for potassium pyrosulphate fusions and are inferior to grade A for sodium hydroxid fusions. . . .

"Palau and both grades of rhotanium may all be used to advantage in the electrolysis of chemical solutions, but only as cathodes. As anodes the alloys are worthless."

**The effect of hydrogen-ion concentration on the liquefaction of gelatin**, H. E. Patten and A. J. Johnson (*Jour. Biol. Chem. 38 (1919), No. 1, pp. 179–190, figs. 7*).—Chemical and physical data, obtained at the Bureau of Chemistry, U. S. Department of Agriculture, are reported which indicate that "the setting of gelatin is influenced by the hydrogen-ion concentration of the medium, and unless the gelatin is destroyed this effect is probably reversible. Gelatin in the concentrations used is not without effect upon the buffer solutions, displacing the pH in such a manner as one would expect from an aggregate of amino acids acting amphoterically."

**Colorimetric determination of the hydrogen-ion concentration in small quantities of solution**, A. R. C. Haas (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 49–55*).—The preparation is described of a number of indicator papers covering the usual working range of pH and which can be used to determine rapidly and

with considerable accuracy the H-ion concentration of small quantities of solution. The indicators described are blue and red lacmoid papers, methyl orange paper with a range of pH of from 2.4 to 3.8, bromophenol (pH 3.4 to 4.6), alizarin sodium sulphonate (pH 4 to 6), neutral red (pH 7 to 9), and azolitmin (pH 6.2 to 8). It is considered advisable when dealing with very small volumes of solution to check the indicator paper determinations by the supplementary use of the spot plate method, in which the H-ion concentration is determined in a drop or two of the solution by comparison of the color produced by a certain indicator in the same quantity of buffer solution of known pH value.

With the described methods, it is considered possible to obtain a pH value differing 0.4 to 0.02 pH or even less from those obtained by the more exact methods.

**The determination of iodid in mineral waters and brines**, W. F. BAUGHMAN and W. W. SKINNER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 6, pp. 563–568*).—The authors at the Bureau of Chemistry, U. S. Department of Agriculture, report an investigation of various methods for the determination of iodin in the presence of chlorid and bromid as a result of which the permanganate method is recommended as the most satisfactory, provided certain directions which are given in detail are observed. In regard to other methods the following conclusions are drawn:

"Distillation with potassium bichromate will not completely liberate iodin from iodids. Iodid in the presence of as much as 10 gm. sodium chlorid can be determined with satisfactory results by distilling with ferric sulphate.

"Iodid can be determined quite accurately in the presence of bromid by a single distillation with ferric sulphate if the quantity of bromid present in the sample does not greatly exceed 0.4 gm. This method is especially recommended for removing iodin from the sample which is to be used for the bromid determination.

"Iodin may be determined in the presence of large amounts of bromid by making a double distillation with ferric sulphate. However, this method is more tedious and time-consuming than the permanganate method, and the results obtained not quite so accurate."

**Studies on the behavior of inulin in the animal body.—Application of the Benedict method to the estimation of levulose and inulin**, R. OKEY (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 33–42*).—The author reports a series of tests on the application to the estimation of levulose and inulin of the modification of the Lewis-Benedict method for sugar determination developed by Benedict and Osterberg (E. S. R., 39, p. 112). The method was found satisfactory for the determination of levulose and of levulose in the presence of inulin. Attempts to determine inulin quantitatively by hydrolysis with the picrate-picric acid and colorimetric determination of the levulose in the same solution proved unsuccessful, owing to the formation of products which on heating, after the addition of the carbonate, gave colors increasing in depth with the time of heating in the acid solution and becoming more intense than those from equivalent quantities of levulose. An increase in depth of color was also produced when glucose and levulose solutions were heated with the acid picrate before the addition of the carbonate.

Hydrolysis of the levulin with hydrochloric acid led to a retardation of the rate of color development which was proved to be due to the salts formed by the neutralization of the acid. It was found that this interference may be avoided by increasing the time of heating with the carbonate to 15 minutes, or by using the higher concentration of the picrate-picric acid recommended

by Benedict (E. S. R., 39, p. 112) for the determination of blood sugar. It is pointed out that this precaution must be taken in estimating the monosaccharids formed by acid hydrolysis of the more complex carbohydrates.

A system of blood analysis, O. Folin and H. Wu (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 81–110 figs. 2*).—A system of blood analysis, the starting point for which is a protein-free blood filtrate, is described in detail. The determinations, which include nonprotein nitrogen, urea, creatinin, creatin, uric acid, and sugar, are all conducted on the filtrate from 10 cc. of the blood.

The precipitation of the blood proteins is brought about by a new protein precipitant, tungstic acid, in the following manner: A measured amount of blood is transferred into a flask having a capacity of 15 to 20 times that of the volume taken and diluted with seven volumes of water. To this are added, by means of pipettes, one volume of 10 per cent sodium tungstate ($Na_2WO_2 2H_2O$) and one volume of 2N/3 $H_2SO_4$. On shaking, the precipitation is complete within a few seconds. The precipitate can be removed by filtering or, if heated on a water bath for two or three minutes, by centrifuging. Filtration is recommended as safer for ordinary work. This precipitation process is said to work equally well with any kind of blood, and is considered by the authors to be superior to all former methods.

The nonprotein nitrogen determination is made with 5 cc. of the protein-free filtrate by the nesslerization process of Folin and Denis (E. S. R., 36, p. 316), with certain modifications in method of procedure and preparation of reagents.

In the urea determination direct nesslerization has been abandoned. For the hydrolysis of the urea, use has been made of jack bean urease or the autoclave, and for the isolation of ammonia, aeration or distillation. Any of the four combinations is said to give satisfactory results, using 5 cc. of the protein-free blood filtrate. The autoclave process is recommended chiefly when a large series of determinations is to be made, or when creatin is to be determined also, as the hydrolysis of the urea can then be accomplished simultaneously with the conversion of creatin into creatinin.

Folin's colorimetric method is employed for the determination of creatin and creatinin, using 10 cc. of the blood filtrate for preformed creatinin and 5 cc. for creatinin and creatin. One standard creatinin solution suitable both for creatinin and creatin determinations is made by transferring to a liter flask 6 cc. of the standard creatinin solution used for urine analysis, adding 10 cc. of normal hydrochloric acid, and making up to the mark with distilled water.

For determining uric acid a modification of the Folin-Denis-Benedict method has been developed which requires only 20 cc. of the blood filtrate (equivalent to 2 cc. of blood), and which is considered to be more dependable as well as more simple and convenient than the original method. The technique of the process is described in full, including the preparation of a new standard uric acid solution, the keeping quality of which is considered superior to any other as yet devised. The solvent is 10 per cent sodium sulphite, which tends to keep the solution free from dissolved oxygen.

Sugar is determined in 2 cc. of the blood filtrate by a new colorimetric method, involving the application of the phenol reagent of Folin and Denis to cuprous oxid obtained by the action of a weakly alkaline copper tartrate solution on the blood sugar. The color produced is said to be intense and stable.

Note on the determination of urea in urine by direct nesslerization, O. Folin and G. E. Youngburg (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 111, 112*).—The authors state that, by using a urease preparation sufficiently free from nitrogenous materials, the urea nitrogen can be nesslerized without any charcoal treatment. The urease solution is prepared by washing 3 gm. of permutit

once with 2 per cent acetic acid and twice with water, adding 5 gm. of fine jack bean meal and 100 cc. of 30 per cent alcohol, shaking gently but continuously for ten minutes, and filtering. The filtrate, which is said to contain practically the whole of the urease and but little other material, is used in amounts of 1 cc. for 1 cc. of diluted urine (1:10) and the digestion and nesslerization conducted as usual, employing the Nessler reagent described in the article noted above.

**A rapid method for the estimation of urea in urine**, J. B. SUMNER and A. BODANSKY (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 57–61*).—The method, which is said to be rapid, accurate, and simple, consists essentially in treating a small quantity of urine in a centrifuge tube with an approximately neutral phosphate solution and with urease. After the urea has been decomposed a protein precipitant (acidified potassiomercuric iodid solution) is added, the tube centrifuged, and an aliquot of the clear supernatant liquid nesslerized and compared wth a standard. The preparation of reagents and method of procedure are described in detail.

**The proximate analysis of wood**, W. H. DORE (*Jour. Indus. and Engin. Chem., 11 (1919), No. 6, pp. 556–563*).—This preliminary report of a study conducted at the California Experiment Station on the chemistry of certain California woods from the standpoint of their chemical utilization, deals with the analytical methods employed and results obtained in a complete proximate analysis of these woods. The analyses included determination of loss on drying, extractives soluble in benzene, extractives soluble in alcohol, substances soluble in water, substances soluble in 1 per cent sodium hydroxid solution, cellulose, and lignin. The woods studied were redwood, yellow pine, live oak, and blue gum.

Sawdust was found to be the most satisfactory mechanical condition of wood for analytical purposes. Cellulose was determined by a modification of the Cross and Bevan method involving chlorination in vacuo, and lignin by König's method with 72 per cent sulphuric acid.

In the analysis of coniferous woods by these methods 96 to 97 per cent of the wood constituents were accounted for, while in the case of the hardwood examined the lignin determinations failed and only from 83 to 91 per cent of the wood constituents were obtained.

**Nitrating of woodpulp cellulose**, S. D. WELLS and V. P. EDWARDES (*Paper, 23 (1919), No. 23, pp. 180–185, fig. 1*).—The authors report an investigation conducted at the Forest Products laboratory, U. S. Department of Agriculture, on the utilization of woodpulp as a source of nitrocellulose. The determination of yields from laboratory nitrations indicated that under favorable conditions a yield of 150 per cent nitrocellulose would be obtained from woodpulp, with a corresponding yield of from 160 to 165 per cent from cotton. The pyro grains from both soda and sulphate pulps prepared from jack pine were dark brown, but the nitrocellulose from unbleached sulphite was as light colored as that from cotton, having lost the yellow coloration from nitration in the boiling and poaching treatments. The products from all the pulps studied met the laboratory tests for completeness of washing, stability, and purity of product.

The factory runs on the woodpulps seem to indicate the suitability of woodpulp properly manufactured for the production of nitrocellulose.

**Studies on canning.—An apparatus for measuring the rate of heat penetration**, W. T. BOVIE and J. BRONFENBRENNER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 6, pp. 568–570, figs. 5*).—The apparatus described was devised to find the rate of transfer of heat from the outside toward the center of cans of food during the process of cooking and sterilization, as affected by the variations

of the autoclave temperature, size of can, viscosity of the food, etc., such as are encountered by the commercial canner.

The apparatus consists of a constant thermojunction, which is maintained at the temperature of the autoclave and is located just outside the can. The actual temperature of this junction is obtained from the readings of a thermograph, the bulb of which is placed close to the constant junction. Connecting the thermograph bulb with the recording clock is a capillary tube which is led out of the autoclave through a suitable steam-tight joint. Connected with the constant junction is a series of variable junctions located in different parts of the cells and joined through a cable of wires to a galvanometer outside of the autoclave, which records all differences in temperature. The apparatus, which is illustrated diagrammatically and described in detail, is said to give very satisfactory results.

**The bacteriology of canning** (*Kansas Sta. Rpt. 1918, p. 49*).—An investigation of methods of canning vegetables is reported, the results of which indicate that blanching does not aid in the sterilizing process, proper sealing aids greatly in preventing spoilage of canned foods, salt, except in amounts too large to be allowable, is of little value, and small amounts of acetic acid (vinegar) are of value in preserving canned vegetables.

**Saving raisins by sulphuring**, F. T. Bioletti and A. E. Way (*California Sta. Circ. 211 (1919), pp. 4, figs. 3*).—This circular describes a sulphuring hood to be used in sulphuring raisins as soon as they are stacked after rain. The hood, consisting of a wooden frame covered with building paper, when made from the specifications given will cover about 26 trays in two stacks and is said to be easily handled by two men. A pan containing about 0.5 lb. of sulphur is placed on the ground between the two stacks. After igniting the sulphur, the hood is placed over the stacks and a little soil is shoveled around the base to make it air-tight. The time during which the grapes must be subjected to the fumes of sulphur dioxid has not been determined, but is thought to be between 5 and 35 minutes.

It is said that by the use of this method the cost of stacking is much reduced, and that even in the wettest and most unfavorable season the crops are not lost.

**Potato drying**, J. Rutishauser (*Die Kartoffeltrocknung. Bern, Switzerland: Ferd. Wyss, 1918, pp. 51*).—A brief description is given of the potato-drying industry in Germany, and suggestions are made for the establishment of such industries in Switzerland.

## METEOROLOGY.

**Introductory meteorology**, W. J. Humphreys et al. (*New Haven: Yale Univ. Press, 1918, pp. XII+150, pls. 19, figs. 50; rev. in Nature [London], 103 (1919), No. 2581, pp. 123, 124*).—This book was prepared and issued under the auspices of the Division of Geology and Geography, National Research Council, for use in "the course of study outlined by the Committee on Education and Special Training of the War Department for Students' Army Training Units." The plan "involves an intensive study of the elements of the subject," but "the book is not intended to be elementary in the sense that it needs no study on the part of students or elaboration and explanation by the instructor."

**The relation between evaporation and the area of the evaporating surface**, W. Gallenkamp (*Met. Ztschr. [Brunswick], 36 (1919), No. 1–2, pp. 16–22, fig. 1*).—Observations are recorded which show that in all cases the rate of evaporation decreased with an increase in the extent of the evaporating area. The decrease in evaporation, however, was not directly proportional to the increase

in surface, being greatest with the first increase in surface and declining with subsequent increases.

Climate formula and reduced rainfall, W. KÖPPEN (*Met. Ztschr. [Brunswick], 36 (1919), No. 1–2, pp. 1–7*).—The author explains a formula which is proposed as a convenient method of briefly designating the climate of a particular place.

The bioclimatic law as applied to entomological research and farm practice, A. D. HOPKINS (*Sci. Mo., 8 (1919), No. 6, pp. 496–513, figs. 3*).—This law, as explained in an article previously noted (E. S. R., 39, p. 317), is defined and certain of its applications discussed.

It is stated that "we have in the so-called bioclimatic law of latitude, longitude, and altitude an example of a natural law which represents the general laws of climate as affecting the seasonal activities and geographical distribution of land-inhabiting species of plants and animals, periodical practice in agriculture, and the adaptation of farm crops to the requirements of climatic conditions. The law is founded on the determined country-wide average rate of variation in the time at which periodical events occur in the seasonal development and habits of plants and animals at different geographical positions within the range of their distribution. Other things being equal, this variation is at the rate of four days for each degree of latitude, 5° of longitude, and 400 ft. of altitude." Isophanal maps of the United States, constructed on this basis, are shown and discussed.

It is claimed that having "the date of a periodical event or practice at an established base in any given season we can, by means of the time constants of the law and their equivalents in latitude, longitude, and altitude, compute a corresponding date constant of the same event for any other place within the range of the species or periodical practice involved. Or, having determined for any section of the country the upper or northern limit in the geographical distribution of a native or introduced species or variety of animal or plant, the corresponding limit constants for altitude or latitude can be computed for any other section; and having determined also the lower or southern limit, the altitude and latitude constants can be worked out for the possible geographical range in which the species or variety, under its other environmental requirements, would survive and thrive."

The applications of the law to entomological research are illustrated in the cases of the southern pine bettle, the western pine beetle, the mountain pine beetle, the pine bark louse, the hatching of Chermes on Pike's Peak, and the Hessian fly.

Among the problems in farm practice which have a direct relation to the bioclimatic law, the following are briefly discussed: "(1) Seedtime and harvest, as applied to a wide range of farm, garden, and truck crops, and as adapted to the varying climatic conditions which prevail from the lowest to the highest latitudes and altitudes and from eastern to western longitudes of the United States, (2) the application of remedies against insect pests and plant and animal diseases, [and] (3) the selection of varieties of domestic animals and cultivated plants and the types of agriculture best adapted to regional and local conditions of soil, climate, etc."

A soil temperature survey of the United States and Canada (*Sci. Amer., 120 (1919), No. 19, p. 481*).—It is announced that a committee of the Ecological Society of America has organized a soil temperature survey of the United States and Canada.

"The present plan is to carry on observations at various places for a number of years under identical conditions. Upwards of 30 stations are now in

operation. Thermograph records are obtained for thermometer bulbs placed at the same depth (3 in. below the ground at all stations with additional readings at 12 in. at certain stations), in level, well-drained soil, free from the shade of trees or buildings, and under a ground surface kept free from sod or weeds, but without continuous cultivation. It is hoped that the data obtained will make it possible eventually to draw isotherms for the soil of the United States and Canada analogous to those that have been drawn for the air over the same countries."

**The climate of Utah**, F. L. WEST and N. E. EDLEFSEN (*Utah Sta. Bul. 166 (1919), pp. 3–66, figs. 48*).—Weather and climate are defined and the various influences and effects of climate are discussed. How weather observations are recorded and forecasts are made are also explained. "The type of climate peculiar to Utah and the configuration of its land surface are discussed; also the areas devoted to the different kinds of agriculture and to the leading industries of the State. The State is divided into climatic zones and a general discussion of each made. Charts showing the distribution of population, the value of the farm land in different sections, and the areas that are irrigated, are inserted. . . . For the principal town of each county, the following data are presented by means of a chart: The precipitation for each year of the record, the mean monthly amount of precipitation, the duration of the growing season for each year, the occurrence of summer rains, and the leading agricultural products. . . . The means and extremes are [also] given with a very brief discussion. A table containing data on precipitation, temperature, and frost for the entire State by towns is inserted."

**[Weather reports for 1917]**, C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1917, pp. 5, 34, 35, 59–61, 72, 73, 90–96*).—Tabular summaries are given of observations on temperature, precipitation, and cloudiness at 25 Weather Bureau stations in Alaska, and the character of the season, with special reference to crop growth and agricultural operations, at the Sitka, Rampart, Fairbanks, and Kodiak Stations is discussed.

**Meteorological observations**, J. S. STEVENS (*Maine Sta. Bul. 275 (1918), pp. 235, 236*).—A monthly and annual summary of observations at the University of Maine on temperature, precipitation, cloudiness, and wind movement during 1918 is given. The mean temperature for the year was 42.99° F., as compared with an average of 42.75° for 50 years; the total precipitation was 37.97 in., the snowfall 95.75 in., the number of clear days 210, the number of cloudy days 73, and the total movement of wind 45,013 miles.

**Meteorological observations at the Massachusetts Agricultural Experiment Station**, J. E. OSTRANDER and A. L. CHANDLER (*Massachusetts Sta. Met. Buls. 363–364 (1919), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1919, are presented. The data are briefly discussed in general notes on the weather of each month.

## SOILS—FERTILIZERS.

**Soil survey of Montgomery County, Iowa**, A. M. O'NEAL, JR., and L. L. RHODES (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 30, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 271,360 acres situated in the southwestern part of the State. The topography is prevailingly rolling, with conspicuous broad, nearly level bottoms along the streams. The elevations range from 1,000 to 1,260 ft. above sea level, and the area is said to possess excellent natural drainage.

The soils of the county are largely derived from the Missouri loess and are quite uniform in both color and texture. Six soil types, representing 5 series, are mapped. Marshall silt loam and Wabash silt loam, occupying 66.1 and 27.1 per cent of the total area, respectively, predominate.

**Soil survey of St. Martin Parish, La.**, A. H. MEYER and B. H. HENDRICKSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 32, fig. 1, map 1*).—This survey deals with the soils of an area of 442,880 acres situated in the southern part of the State and lying wholly within the region of alluvial soils. The topography is prevailingly flat and natural drainage is rather sluggish.

The soils of the region comprise upland, low terrace, and first bottom alluvial deposits, the latter comprising about 70 per cent of the whole. Exclusive of peat, 11 soil types of 6 series are mapped, Sharkey clay, occupying 71.8 per cent of the total area, predominating.

**Soil survey of Mahoning County, Ohio**, M. W. BECK and O. P. GOSSARD (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 41, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Experiment Station, deals with the soils of an area of 273,280 acres situated in the northeastern part of the State, bordering the State of Pennsylvania. The topography of the region is gently undulating to rolling, and the average elevation is about 1,000 ft. above sea level. Natural drainage is fairly well established, but is said to be insufficient in many localities for the best results in farming.

The soils of the county include upland soils composed of reworked glacial material, terrace or old alluvial soils laid down as glacial outwash plains or old stream flood plains, and first-bottom or recent alluvial soils. In addition to muck, 19 soil types representing 12 series are mapped. Volusia silt loam, Canfield silt loam. and Mahoning silt loam, occupying 26.8, 20, and 19.8 per cent of the total area, respectively, predominate.

**Sandy soils and how to farm them**, A. R. WHITSON and H. W. ULLSPERGER (*Wisconsin Sta. Bul. 299 (1919), pp. 26, figs. 8*).—This describes in a rather popular manner approved methods of crop production on the sandy soils of Wisconsin. It is stated that approximately one-fifth of the area of the State (6,000,000 acres) is classed as sandy loam, fine sand, and sand. The correction of acidity, the addition of humus, and the judicious use of fertilizers are regarded as the principal factors in the improvement of these soils, while spring plowing, the planting of windbreaks, the growing of cover crops, and the use of a corrugated roller tend to protect the soil. Soy beans and clover seed are regarded as the best cash crops, while alfalfa, vetch, buckwheat, sweet clover, serradella, wheat, barley, oats, cowpeas, potatoes, and corn require special consideration when grown on sand. Garden crops are said to give good results.

**The "slick spots" of middle western Idaho with suggestions for their elimination**, P. P. PETERSON (*Idaho Sta. Bul. 114 (1919), pp. 3–11, figs. 3*).—The nature of these spots is briefly described and studies of their chemical and physical properties discussed in an effort to ascertain the factors underlying their formation. It is stated that the characteristics which render these areas unproductive are their impermeability to water and their impenetrability to plant roots. The conclusion is reached that this condition is due largely to the cementing action of calcium carbonate which is present in greater quantities than in adjacent good soils, this cementing action having occurred when calcium was deposited from solutions in the soil.

Heavy applications of barnyard manure are held to be the most effective means for overcoming the physical defects of these spots, through the solvent action on the calcium compounds of the decomposing humus with a consequent flocculation of the soil particles. The use of green manure crops is also recommended.

Gypsum applied at the rate of from 300 to 400 lbs. per acre before fall plowing is deemed worthy of trial as a mineral flocculent, while burned lime is regarded as of value for small areas.

**The value of legumes on Indiana soils**, A. T. Wiancko, S. D. Conner, and S. C. Jones (*Indiana Sta. Bul. 226 (1919), pp. 19, figs. 6*).—Based on results secured on the station farm and on outlying experiment fields, it is concluded that from 25 to 50 per cent of the nitrogen and humus of the soil of the State has been used up or lost by the cropping systems employed, and that the increased growth of legumes is the easiest and most economical method of restoring nitrogen and organic matter to run-down soils. As an average for 61 crops grown on 8 experiment fields during the last 12 years, crop rotations containing legumes produced 4.6 bu. of corn and 4.7 bu. of wheat per acre more than rotations in which no legumes were grown. Factors contributing to successful clover production are indicated and the use of soy beans or cowpeas recommended when clover fails.

**The continuous growing of wheat and rye with and without a legume as green manure, 1917**, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1917, pp. 350–352*).—In the continuation of work previously noted (E. S. R., 39, p. 725), further observations have been made upon the effect upon the nitrogen supply of the soil of growing a legume between the main crops of a rotation.

Wheat and rye grown alone have produced at the rate of 7.33 and 13.67 bu. of grain and 780 and 1,720 lbs. of straw per acre, containing 14.44 and 24.94 lbs. of nitrogen, respectively. Wheat followed by soy beans as a green manure crop produced 12.33 bu. of grain and 1,420 lbs. of straw, containing 28.78 lbs. total nitrogen. Under similar conditions rye produced 14.33 bu. of grain and 2,760 lbs. of straw, containing 34.7 lbs. total nitrogen.

**H-ion concentrations in extracts of peat soils and of peat- and humus-forming plants**, H. Kappen and M. Zapfe (*Zentbl. Agr. Chem., 47 (1918), No. 7, pp. 193–197; abs. in Physiol. Abs., 3 (1919), No. 11, p. 583; Chem. Abs., 12 (1918), No. 19, p. 2035*).—Continuing work previously noted (E. S. R., 37, p. 623), observations are described on samples of soils taken at different depths ranging from 0 to 165 cm. (about 64.4 in.), of the subsoil below 165 cm., and of cultivated peat soil receiving different fertilizer treatments, together with samples of fresh sphagnum, and pine and spruce needles. Extracts were prepared by treating 10 gm. of the material for 2 hours with 200 cc. of either water, normal potassium chlorid solution, or a 10 per cent calcium acetate solution. The water extracts were slightly yellowish in color, while the other extracts were colorless. The titratable acidity and the H-ion concentration were determined in each case. Observations were also made on the conductivity of the aqueous solutions and the air-dry and the ignited residues determined.

It is concluded that soluble acids were present in the peat soil in traces only, since the H-ion concentration but slightly exceeded that corresponding to the neutral point. The power of these soils to decompose neutral salts is thought to be due to an exchange of ions rather than to the liberation of free acid. The H-ion concentration of aqueous extracts of peat- and humus-forming plants was generally high and the true acidity marked.

**The value of ammonification test**, J. C. Temple (*Georgia Sta. Bul. 126 (1919), pp. 3–18*).—Observations on the ammonifying efficiency, ammonifying inoculating power, and ammonifying capacity of different soils subjected to various treatments have led to the conclusion that the ammonification test is of little value in ascertaining the nature of the soil microflora, because (a) the rate of ammonia production is largely controlled by the soil medium, (b) all soils are well supplied with bacteria capable of changing nitrogen into

ammonia if the soil is made a suitable medium, and (c) the test as usually conducted fails to account for considerable amounts of ammonia which may escape into the atmosphere or are converted into nitrate or nitrite. It is stated, however, that the test can probably be employed by the soil chemist or physicist to determine soil fitness.

**Ammonification of manure in soil**, H. J. CONN and J. W. BRIGHT (*Jour. Agr. Research [U. S.], 16 (1919), No. 12, pp. 313–350*).—This contribution, from the New York State Agricultural Experiment Station, supplements previously reported investigations (E. S. R., 37, pp. 516, 517) and deals mainly with the results of a detailed laboratory study of two of the most easily recognized types of nonspore-forming organisms which are especially active as ammonifiers in freshly manured soil, namely, *Pseudomonas fluorescens* and *Bacillus caudatus*, renamed *P. caudatus*. The first part of the paper "shows the predominance of these two organisms in manured soil and gives the results of an investigation of their function in soil. The second gives a detailed description of the two organisms to aid in their identification by others."

The results confirmed previous conclusions that the nonspore-forming bacteria are the most active ammonifiers in manured soil. "Pure cultures of *P. fluorescens* and *P. caudatus* multiply much more rapidly in sterilized manured soil than do pure cultures of *B. cereus* (selected as a typical spore former). When sterilized manured soil is inoculated with a mixture of these three organisms in pure culture, the two nonspore formers immediately gain the ascendency, *B. cereus* occurring in too small numbers for detection by the ordinary methods of study.

"In field soil to which there has been no addition of organic matter for several years, *P. fluorescens* and *P. caudatus* were rarely found, while *B. cereus* was a common organism. When this same soil was mixed with manure and potted, *P. fluorescens* and *P. caudatus* immediately multiplied rapidly, while but small numbers of *B. cereus* spores and no active forms of *B. cereus* could be found.

"All three of these organisms are vigorous ammonifiers when tested in pure culture. The activity of the nonspore formers and the absence of activity of the spore formers in unsterilized manured soil leads to the conclusion that *P. fluorescens* and *P. caudatus* are important ammonifiers of manure in soil, while there is no evidence that *B. cercus* takes part in this process.

"Detailed descriptions are given of the two ammonifying organisms studied. The culture of *P. fluorescens* studied has been compared with other fluorescent bacteria isolated from soil, and a review of the literature relating to fluorescent bacteria has been made. It has not proved possible to fix definite limits for this species. *P. caudatus* is the name now assigned to the organism previously denoted by one of the writers as the 'orange-liquefying type.' It is apparently identical with the organism described by Wright in 1895 and seems to be quite common in soil and water."

A list of 54 references to literature cited is given.

**Preservation of nitrogen in liquid manure**, VOGEL (*Zentbl. Agr. Chem., 47 (1918), No. 7, pp. 201–203; abs. in Chem. Abs., 13 (1919), No. 3, p. 244*).—It is stated that sodium acid sulphate used at the rate of 40 kg. per cubic meter (about 67.7 lbs. per cubic yard) is the best chemical agent for preventing loss of nitrogen from liquid manure, material treated in this manner having given excellent results in tests on meadow land and with rye, potatoes, and beets. To avoid the caustic effects of the acid sulphate it is recommended that an equal amount of gypsum be used in combination with it. The use of from 1 to 2 per cent of a solution containing formaldehyde and phenol resulting

as a by-product of the Bakelite industry prevented the loss of nitrogen from urine without any subsequent injury to germination.

The science and practice of manuring, W. Dyke (*London: The Lockwood Press (1918), rev. and enl., pp. [2]+157+[3]; rev. in Nature [London], 102 (1919), No. 2573, p. 485*).—This is a revised and enlarged edition of this work, which treats the subject from the standpoint of the commercial horticulturist and is based to a large extent upon the successful practical experience of the author.

[Report of soil fertility work in Massachusetts], E. F. Gaskill (*Massachusetts Sta. Rpt. 1917, pp. 21a–32a*).—Noting the progress of work previously mentioned (E. S. R., 38, p. 218) this comprises a report on comparative tests of barnyard manure, nitrate of soda, sulphate of ammonia, and dried blood in various fertilizer combinations, with and without lime, on Green Mountain potatoes; muriate *v.* high-grade sulphate of potash on alfalfa, blackberries, currants, gooseberries, mangels, rhubarb, raspberries, and soy beans; manure and various combinations of chemical fertilizers on asparagus and tomatoes, and on both limed and unlimed beets and onions; different forms of potash, including kainit, high- and low-grade sulphate, muriate, nitrate, carbonate, and treater dust on Early Canada Flint corn; various kinds of phosphates, including Arkansas, South Carolina, Florida soft, and Tennessee rock phosphate, slag, dissolved bone black, raw bone, dissolved bone meal, steamed bone, and acid phosphate on Medium Green soy beans; a fertilizer mixture high in potash (160 lbs. of muriate per acre) and low in phosphoric acid *v.* one without potash and high in phosphoric acid for corn; various fertilizer treatments used continuously, alone and in different combinations on cabbage, both limed and unlimed; different combinations of fertilizers used continuously with lime on corn; different systems of top-dressing meadows; and sulphate of ammonia *v.* nitrate of soda as a top-dressing for permanent meadows.

Potatoes grown on the limed area produced scabby tubers in every case, amounting to 75 per cent in one instance, while only two of the unlimed plats showed any scab, the injury amounting to about 10 per cent in each case.

Top-dressing permanent meadow with barnyard manure has resulted in an average yield of 6,006 lbs. of hay per acre as compared with 5,824 lbs. from an application of bone and potash, and 5,496 lbs. from slag and potash (formerly wood ashes). No potash was applied in 1916 and 1917. The omission of potash on a permanent meadow usually receiving complete chemical fertilizers was accompanied by a normal crop of hay in 1916, a favorable season for hay production, but by a crop much below normal in 1917, an unfavorable season.

Experiments in fertilizing a crop rotation, T. L. Lyon (*New York Cornell Sta. Bul. 399 (1919), pp. 19–30*).—In connection with experiments previously noted (E. S. R., 30, p. 829), in which all the farm manure or commercial fertilizers were applied to timothy in a rotation comprising three years of timothy followed by corn, oats, and wheat, a new series of tests is described, in which a comparison was made of this practice with that of fertilizing the grain alone. The soil upon which the tests were made is said to be particularly well adapted to timothy, less so to small grains, and poorly suited to corn, although its natural fertility is high. Observations were also made on the effect of withholding potash from the fertilizer mixture for grass as compared with the use of a moderate amount. The results are presented in tabular form, together with data showing the estimated value of the crops based both on prewar prices and on prices as of July 1, 1918.

It is concluded that a moderate quantity of a complete commercial fertilizer applied during each of the three years the land was in timothy was more profit-

able than a somewhat similar fertilizer applied to corn, oats, and wheat. The application of 5 tons of farm manure per acre to each of three timothy crops also proved to be more effective than an application of 15 tons to corn alone. Doubling the amount of manure applied to both grass and corn resulted in increased yields of crops, but not in proportion to the cost of the treatment. The use of potash in conjunction with sodium nitrate and acid phosphate on grass appeared to be profitable at prewar prices.

A brief outline of the technical procedure followed in conducting the experiments is appended.

**Experiments with various nitrogenous fertilizers**, E. A. MITSCHERLICH, S. VON SAUCKEN, and F. IFFLAND (*Jour. Landw., 66 (1918), No. 3, pp. 187–198, pl. 1, fig. 1*).—Sand culture experiments with oats conducted during 1917 and 1918 are described, in which observations were made upon the relative value of different nitrogen carriers, with particular reference to urea and urea nitrate. The fertilizers were applied in varying amounts, both before seeding and one-third at the time of seeding, with the remainder as a top-dressing, one-half being applied upon the formation of the fourth leaf and one-half upon the appearance of the panicle. The yields of grain and straw are presented in tabular form.

The conclusion is reached that both urea and urea nitrate are as effective as the usual nitrogen carriers (sodium nitrate, calcium cyanamid, ammonium sulphate, and ammonium nitrate), and that urea nitrate may be used to advantage for top-dressing.

**The influence of the mechanical composition of the soil on the availability of nitrate of soda and dried blood**, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stas. Rpt. 1917, pp. 335–350, pls. 2, figs. 3*).—Further observations (E. S. R., 39, p. 726) on the relative availability of nitrate of soda and dried blood to barley and a residual crop of buckwheat when applied in equivalent amounts to cylinders containing shale soil and different mixtures of shale and sand have led to the following conclusions:

For all soil combinations the average recovery of nitrogen from nitrate of soda by the main crop was 60.53 per cent and from dried blood 30.98 per cent. With the buckwheat the average recovery of nitrogen was 2.47 per cent for the nitrate and 10.57 per cent for the dried blood cylinders. The dried blood showed an availability of 68.2 on the basis of 100 for the nitrate.

"From these results, and likewise from the results secured for a period of years, it is quite clear that nitrate of soda can not be counted on to show much residual effect. Dried blood, on the other hand, does show some residual effect on both heavy and light soils. However, the initial effect of the nitrate is almost always sufficiently above that of the blood to place the former in first rank when the combined crops—that is, the first crop and the residual crop—are taken into consideration. A pound of nitrate nitrogen produces more dry matter than a pound of dried blood nitrogen, and therefore, in most cases, is worth more.

"The nitrogen of the soil organic matter is more completely utilized in a light soil than it is in the heavier types."

**The present status of nitrogen fixation**, A. H. WHITE (*Jour. Indus. and Engin. Chem., 11 (1919), No. 3, pp. 231–237, figs. 3; Sci. Amer. Sup., 87 (1919), No. 2264, pp. 330, 331, fig. 1*).—The present status of the development of the arc, cyanamid, nitride, direct synthetic ammonia, and cyanid processes is reviewed. Diagrams are given showing the world's production and consumption of fixed inorganic nitrogen (including Chilean nitrate).

Production doubled from 1909 to 1917, largely as a result of the great demand for nitrogen compounds in munitions making. There was, however, no greater increase in production during the war than in the period immediately preceding

it. "The year 1917 shows no increase from Chilean nitrate, in spite of the urgent demands of the Allies for greater supply. This was partly due to lack of ships. The greatest increase . . . for the period 1909–1913 is shown by the by-product coke ovens. In 1917 the increase was mainly due to the cyanamid and Haber processes, so that in this year the world's supply came almost equally from the three sources, Chilean nitrate, coke ovens, and synthetic, the cyanamid process being the most important in the latter group, with the Haber second."

It is thought that the rapid rate of increase indicated for the period 1909–1913 is not likely to continue. "The largest demand for fixed nitrogen in the future will probably be for fertilizers, and the use of fertilizers will be very largely a matter of price. . . . If all the resources of Chile and all the facilities in the way of coke ovens now under construction and fixation plants should be utilized, the year 1920 might well see a possible production of 25 per cent more than 1917. . . .

"The cheapest source of fixed inorganic nitrogen will undoubtedly be the ammonia from by-product coke ovens because it is a by-product and the cost of collecting and putting it into marketable form is small. The coke ovens of the world can now produce more fixed nitrogen than the world used from all sources 10 years ago. It will be a powerful factor tending toward low prices. It is probable that Chilean nitrate could, if necessary, be sold at lower prices than in former years. The fixation processes will therefore have to be prepared to meet possible low prices if they are to be ranked as anything more than emergency reliances."

**The phosphate-rock industry in 1918** (*U. S. Geol. Survey Press Bul. 411 (1919), p. 2*).—It is stated that the production of rock phosphate in the United States in 1918 was 2,490,760 long tons valued at $8,214,463, as compared with 2,584,287 tons valued at $7,771,084 in 1917. Florida land pebble constituted 80 per cent of the total output. There was, however, a small decrease in production of land pebble, but a considerable increase in Florida hard and soft phosphates. The production of phosphate in South Carolina increased about 11 per cent in 1918, but that of Tennessee and Kentucky was about 27 per cent less and of the Western States 20 per cent less.

**Vegetation experiments on the availability of phosphorus and potassium compounds**, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1917, pp. 353–368*).—In continuation of work previously noted (E. S. R., 36, p. 820) further observations made during 1916 and 1917 on the relative availability of various phosphorus carriers for soy beans grown in pot tests are recorded, together with a report on similar tests made during 1917 with greensand marl as a source of potash for different crops. The results secured may be summarized as follows:

With soy beans grown in coarse white sand, basic slag as a source of phosphorus gave about as good yields as acid phosphate, while under the same conditions blue rock phosphate yielded only slightly more than the check, and brown rock somewhat better than the blue rock. The average percentage of nitrogen in the dry matter (soy bean hay) was about the same with basic slag as with acid phosphate, but was distinctly and uniformly less with raw rock and where no phosphate was used.

On coarse white sand, with greensand marl as a source of potash, barley and buckwheat gave greatly increased yields over the checks, while on a coarse yellow sand containing 1.09 per cent total potash ($K_2O$) oats and buckwheat gave very fair yields without potash treatment, and applications of marl did not appreciably increase the yields. On the same soil, barley showed a slight increase over the check for the marl treatment. On both the white and yellow

sand, soy beans, when inoculated and supplied with available phosphates and lime gave practically as good yields on the checks as on the marl-treated pots up to the time the pods were about one-half filled, although when allowed to mature there was an appreciable falling off in the yield of seed on the check pots, the yield of stalks being about the same on the check pots as on the treated pots. Dry matter (soy bean hay) from check pots and from marl-treated pots contained quite as high a percentage of nitrogen as that from pots treated with a soluble potash salt ($K_2SO_4$). The amount of potash in dry matter (soy bean hay) from pots treated with soluble potash was notably higher than in that from marl-treated pots or check pots, but is said to represent a "luxury" consumption since the yield of dry matter and percentage of nitrogen are not thereby increased.

The results secured are held to indicate that there is a very close connection between the presence in the soil of soluble phosphates and the accumulation of nitrogen by the soy bean plant. It was also shown that soy beans, when inoculated and furnished with lime and soluble phosphate, can make a good growth and accumulate a high percentage of nitrogen, up to the time the pods are half filled (hay), without the aid of readily soluble potash compounds.

"The work suggests the possibility of utilizing the potash of greensand marl and the potash of natural soil materials by growing soy beans and possibly certain other crops, which could be returned to the soil and thus furnish available potash for those crops which can not so readily utilize potash from these natural sources."

**The world's supply of potash,** C. MATIGNON (*Rev. Sci. [Paris], 57 (1919), No. 8, pp. 225–230*).—This is a general discussion of the potash content of the earth's crust, the disintegration of potash-bearing rocks, the solution and removal of potash salts to the sea, and the formation, character, and extent of potash deposits.

**The use of lime on Iowa soils. Limestone and fertilizer dealers,** G. E. CORSON (*Iowa Sta. Circ. 58 (1919), pp. 7*).—This comprises a brief popular account of the value of lime for correcting soil acidity, together with results of tests and other information relating to the form, amount, and method of applying lime. A list of limestone and fertilizer dealers is included.

**Fertilizer analyses,** A. J. PATTEN, C. F. BARNUM, E. F. BERGER, A. L. LEWIS, and M. L. GRETTENBERGER (*Michigan Sta. Bul. 283 (1918), pp. 3–48*).—This reports the actual and guarantied analyses of 863 samples representing 279 brands of commercial fertilizers and fertilizing materials collected during 1918. It is stated that 6.3 per cent of the samples were below the guaranty in nitrogen, 0.6 per cent in total phosphoric acid, 6.4 per cent in available phosphoric acid, and 11.4 per cent in potash.

**Analysis of fertilizers for 1918,** B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 189 (1918), pp. 10*).—This reports the results of the actual and guarantied analysis of 147 official samples of commercial fertilizers and fertilizer materials collected during 1918.

**Analyses of commercial fertilizers, fertilizer supplies, and home mixtures,** C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 331 (1918), pp. 5–47*).—This bulletin contains a report on the actual and guarantied analyses of 204 brands of complete fertilizers, 274 brands containing nitrogen and phosphoric acid, 5 home mixtures, and 114 samples of fertilizer materials collected during the spring months of 1918.

**Analyses of commercial fertilizers and ground bone; analyses of agricultural lime,** C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 334 (1918), pp. 5–42*).—Supplementing the report noted above, the remaining analyses of samples of commercial fertilizers and fertilizing materials collected during the

1918 inspection are presented, together with a discussion of the entire 1918 inspection. A total of 1,385 samples was received for analysis. Deficiencies in one or two plant food elements occurred in 30 per cent of the brands examined.

Analysis of 20 samples of burned lime, limestone, and lime refuse are included.

A list of brands registered for sale since January 28, 1918, for the fiscal year ended October 31, 1918, is presented.

**Fertilizer registrations for 1919**, C. S. CATHCART (*New Jersey Stas. Bul. 335 (1919), pp. 5–36*).—This comprises a tabulated statement of all the brands of fertilizer materials and mixed fertilizers registered in New Jersey up to January 30, 1919, for the fiscal year ending October 31, 1919.

## AGRICULTURAL BOTANY.

**[Activities of the] department of botanical research**, D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book, 17 (1918), p. 55*).—Introducing more or less detailed reports of members of the institution, the director states that during the year 1918 the scope of experimentation has been narrowed and subordinated to the preparation of manuscripts and that exploration and field work have been reduced, as also has collaboration with workers outside the institution.

Much attention has been devoted to the study of fundamental problems in carbohydrate metabolism and to the imbibitional action of the plant colloids in growth, all of the water relations of the plant being necessarily taken into consideration. An adequate physical explanation of the origin and action of the spinose and succulent plants constituting the characteristic desert vegetation has been found. Important geographic and ecological results have been formulated, some of which are noted below or previously.

**Development of conceptions included in growth**, D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 55–57*).—As preliminary to the reports and discussions which follow, it is stated that three main conceptions concerning growth and its developmental aspects in plants are to be met in the history of physiology during the last half century. The earliest, that of special substances appearing in developmental and seasonal crises and considered necessary for growth and for the origination and development of reproductive organs or of any bud, has given place to the view that formative material as such has no actual existence. From the present standpoint it is assumed that growth proceeds from and depends upon states, combinations, or accumulations in connection with living matter rather than from any differentiated substance.

The second aspect of the subject deals with the incorporation of new material in the cell and its subsequent distension. The protoplast is dealt with as a tonoplast, the center and seat of energy being the vacuole, while an indispensable organ is an ideal semipermeable membrane acting according to the conception of Pfeffer and de Vries.

The third group of inquiries has been directed toward measurements for establishing the physical constants of growth, the subject having formerly been dealt with as a unified process or as a series of successive reactions in studies of temperature effects.

It is held that the chief defect in all three groups of research is in the neglect of the fact that the metabolism upon which growth depends is a constellation, not a linear series of transformations, and that the most important part of the

process lies within the realm of surface tensions in which the play of imbibition is the determining factor.

A further prerequisite to rational advance in researches on growth is a recognition of the fact that a general identity of protoplasm of plants and animals does not exist. The relative amounts of proteins, carbohydrates, lipins, and salts differ widely between these two groups. While the plant can synthesize carbohydrates, amino acids, etc., which the animal can not, the respiration and metabolism of the plant are predominantly carbohydrate, while those of the animal are proteinaceous. It is held that the fundamental and ultimate structure of protoplasm is a result of the force of surface tension, and is that of a gel in which the solid material occurs in two main states or phases with water. In the more liquid phase the molecules of the substance are associated with such a large proportion of water as to be in a liquid condition, while in the more solid phase the proportion of water is much less. These phases have a distinct architecture likened to that of a mesh, felt, foam, or honeycomb in which the denser phase forms the framework and the fluid fills the interstices. Under certain conditions the phases may be reversed and the solid particles may be rounded into globules entirely surrounded by the fluid.

The essential feature of an idealized growth according to the present conception is the accretion or addition of water and material to the mass of colloid constituting the cell, the end-process being the hydration of a colloid. In that type of growth in which carbohydrates or proteins are carried into the mass by water, such an accumulation would, under surface tension, result in the aggregation of new masses of material. Such formation of additional elastic gel structure might occur throughout the entire cell, but in actuality would be modified and controlled at every point by the factors which affect hydration.

**The nature and course of growth in higher plants**, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 58, 59.*)—The results obtained following the development and employment of the auxograph are said to have shown that much of the present confusion as to the main features of growth has resulted from attempts to compare and harmonize growth in organisms presenting physical conditions not really comparable. Data obtained from growth measurements on plants mentioned have shown a decrease in growth rate with daily variations (swellings and shrinkage) corresponding to internal changes. Shrinkage becomes more marked as maturity approaches. While some portions may show continuous enlargement, older parts of the stem may take up and give off water in a manner entirely reversible, showing a very wide range of alterations. The estimation of the balance between water loss and water supply, as implied in the experimental results here referred to, is considered to have given a new and more important meaning to relative humidity as affecting plant growth.

**The growth mechanism of protoplasm**, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 57, 58*).—Experimental studies are said to have established the view that protoplasm in plants consists of a comparatively inert base of pentosans, which may be diffused or transformed only at a very slow rate, in colloidal combination with proteins, amino acids, lipins, and salts to form a complex mass varying from the liquid condition to that of an elastic gel. The volume and changes in volume constituting growth are determined by the proportion of water taken up, this in its turn being a resultant of the proportions of the main constituents. Other soluble carbohydrates probably do not affect directly enlargement of the protoplasmic mass, but they may exert in the vacuoles an osmotic effect additive to that of the amino acids which may accumulate in these cavities.

It is to the osmotic activity of these substances in the vacuoles that turgidity is due, and it is upon this largely that the maintenance of the turgidity of organs depends. The complete conception of the cell includes its expansion by the osmotic action of electrolytes and by the swelling resulting from imbibition or hydration of its colloids, as well as the effect of such increasing changes within its mass.

Nowhere is metabolism more active than in the embryonic growing cells. Changes are mentioned which are thought to exemplify but by no means to exhaust the possibilities of modifications of the colloidal action in growth.

Temperature and the hydration and growth of colloids and of cell masses, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 68–70*).—Recognition of the complex character of the groups of reactions which enter into the more prominent life processes is said to have brought conviction as to the futility of attempts to define physical constants, such as temperature coefficients. Results of series of experiments are tabulated.

Comparison of salt requirements for young and for mature buckwheat plants grown in sand cultures, J. W. Shive (*New Jersey Stas. Rpt. 1917, pp. 409–413, fig. 1*).—A brief account is given of investigations previously reported (E. S. R., 39, p. 524; 40, p. 425).

A comparative study of salt requirements in solution cultures for the growth of buckwheat to the flowering stage and to maturity, W. H. Martin (*New Jersey Stas. Rpt. 1917, pp. 419–422*).—This reports in condensed form the results of experiments previously noted (E. S. R., 39, p. 524).

Experiments to determine whether one form of phosphorus in a complete nutrient plant solution is more available for the growth of buckwheat seedlings than are other forms, H. L. Bancroft (*New Jersey Stas. Rpt. 1917, pp. 423, 424*).—A brief report is given of studies made to determine the relative availability of different forms of phosphorus in a Tottingham nutrient solution. The original solution contains monopotassium phosphate, potassium nitrate, calcium nitrate, and magnesium sulphate. In place of the monopotassium phosphate, monosodium phosphate, monocalcium phosphate, monomagnesium phosphate, and monammonium phosphate were substituted in the different series. Buckwheat was grown in the different solutions to the flowering stage, and while the data have not been completely tabulated, it is stated that great variations in height, general growth, toxic effect, and final weights for the buckwheat plants were found. As a rule the original Tottingham solution, containing phosphorus in the form of monopotassium phosphate, produced a larger total dry weight of plant substance than did any of the other forms of phosphorus, while the series receiving monammonium phosphate produced the smallest total growth of plants.

The toxicity of phosphates toward soy bean seedlings, J. W. Shive (*New Jersey Stas. Rpt. 1917, pp. 405–408*).—A condensed account is given of investigations previously reported (E. S. R., 39, p. 827).

Effect of ammonium sulphate in nutrient solution on the growth of soy beans in sand cultures, M. I. Wolkoff (*New Jersey Stas. Rpt. 1917, pp. 416–419*).—This is a summary of investigations previously reported (E. S. R., 40, p. 30).

Absorption of sodium and calcium by wheat seedlings, H. S. Reed (*Bot. Gaz., 66 (1918), No. 4, pp. 374–380, fig. 1*).—The author has studied the effects of sodium and calcium compounds applied to wheat seedlings in lower concentrations than those commonly used. He has found that antagonism is present even under these conditions, and also that concentrations of sodium chlorid strongly toxic to wheat seedlings were rendered harmless by a

3:100,000 calcium oxid solution. Antagonism was most complete when the ratio sodium:calcium equaled 98:2. At this ratio the sodium was not excluded from the plant but was rendered harmless. The antagonism appears to be internal rather than peripheral.

**The influence of the roots of growing plants upon the activity of soil microorganisms as indicated by the production of carbon dioxid from the soil,** J. R. NELLER (*New Jersey Stas. Rpt. 1917, pp. 414, 415*).—The possible influence of the roots of growing plants on the rate of liberation of plant food by soil microorganisms has been investigated by growing buckwheat and barley plants in soil or sand under bell jars and noting the production of carbon dioxid which was derived from decomposing organic matter. In the case of the plants grown in sand, ground alfalfa hay was added as a source of carbon dioxid.

It was found that slightly more carbon dioxid was liberated from the bell jars containing plants than from those without plant growth. In a second series of experiments buckwheat was grown as a residual crop in the same jars of sand, and again more carbon dioxid was recovered from the bell jars containing plants than from the others.

The author concludes that under the conditions of the experiments the growing roots of barley and buckwheat do not inhibit the decay of organic matter.

**Gas interchange in Mesembryanthemum and other succulents,** H. M. RICHARDS (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 63, 64*).—A continuation of work previously reported (E. S. R., 40, p. 29), the problem now being to account for the low carbon dioxid: oxygen ratio. It is suggested that occlusion of carbon dioxid by the fleshy tissue may be involved. It is considered probable that the processes involved are somewhat different from those presented by the succulent tissue of the cacti. It appears to be important to select tissues of like acidity in order to obtain proper results from such work.

**Photosynthesis and respiration,** H. A. SPOEHR and F. LONG (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 60, 61*).—It is stated that for the purpose of more adequate study of photosynthesis, for which purpose simple, thin leaves have proved to be the best material, a rather elaborate device has been constructed for accurate control of temperature, light, air supply, and water vapor. The method now used is based upon the differential determination of the amount of carbon dioxid fixed by the plant, as determined with special apparatus for estimating the carbon dioxid absorbed in barium hydroxid. The features of the general problem now under investigation are rather numerous, though closely coordinated and interdependent, comprising a study of the basic metabolism of mature leaves and the influence of such metabolism and of the varying sugar content of the leaf on photosynthesis.

It is stated that leaves of different species give enormous differences as regards rate of carbohydrate elaboration and consumption. In cacti and other plants rich in carbohydrates, increase thereof above certain limits does not result in increased carbon dioxid evolution. Photosynthesis appears to be closely related to sugar content and to the respiratory activity of the leaf. Leaves having carbohydrate supply greatly depleted show, when first exposed to light, a low rate of carbon dioxid fixation. This rises until an abundance of carbohydrates has accumulated, after which it decreases.

**The carbohydrate economy of cacti,** H. A. SPOEHR (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 61–63*).—Having followed this subject through the third year (E. S. R., 40, p. 30), the author reports that the continued dry weather kept the monosaccharid content low until the cold nights of the late winter months effected a change, the monosaccharids then rising and the carbohydrate equilibrium becoming about normal after the occurrence of the late winter rains.

It appears that the water requirements of the cacti are easily satisfied. The studies on the effect of water content and temperature on carbohydrate equilibrium have substantiated and elaborated the former findings. No simple or constant relation was established between the rate of carbon dioxid elimination and the carbohydrate supply, nor was respiration very definitely associated with any group of carbohydrates, although a certain negative correspondence is pointed out. It is thought that under certain conditions cacti possess the power of utilizing polysaccharids and aplastic material. The formation of pentosans is intimately associated with this condition in ways which are noted in connection with further studies now in progress.

**Acidity of mesophytic and succulent forms of Castilleia, Ericameria, and Erigeron,** H. M. RICHARDS (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 64, 65*).—Some forms of variation in succulence and acidity were determined and are discussed, this work dealing with *Ericameria cricoides*, *C. latifolia*, and *Erigeron glaucus*.

**The acclimatization of plants,** G. L. SUTTON (*Advisory Council Sci. and Indus., Aust., Bul. 7 (1918), pp. 86–95*).—In addition to a discussion by the author and others of the naturalization and acclimatization of plants, an account is given of plans and measures for the organized control of activities connected with the introduction of plants into portions of Australia.

## FIELD CROPS.

**Dry farming in Arizona,** A. M. MCOMIE, C. B. FILLERUP, and L. L. BATES (*Arizona Sta. Bul. 84 (1918), pp. 491–642, figs. 47*).—This bulletin comprises a rather detailed discussion of the geology and soils of the State, temperature and atmospheric movements in the region, the principal dry-farming sections of Arizona, Indian agriculture in Arizona, and farming operations of early white settlers, together with a digest of the results of several years' experimental work on the Snowflake, Prescott, and Sulphur Spring Valley dry farms, dealing with cultural methods, choice of crops, variety tests, live-stock feeding, silage production, and observations on cooperative management between dry-farming and range stock interests. Results secured on another farm in the Sulphur Spring Valley have already been noted (E. S. R., 29, pp. 725, 735).

It is stated that in the southern part of the State, at an altitude of 4,000 ft. and with a long growing season, Kafir corn, Club-top sorghum, milo maize, and tepary beans gave the best results, while in the northern part, under less stringent conditions, quick growing, drought-resistant varieties of corn, Sudan grass for hay, potatoes, several varieties of beans, and even orchard fruits were also found to be suited to dry farming. The production of silage is deemed to be of considerable importance, particularly in connection with the range cattle industry, it being maintained that large areas of semiarid lands within the State might be developed to advantage in cooperation with the range stock interests.

**Dry farm crop rotations and cultural methods,** A. ATKINSON and L. F. GIESEKER (*Montana Sta. Circ. 81 (1918), pp. 49–58*).—This comprises a brief popular account of work previously noted (E. S. R., 39, p. 131).

**Report of [field crops] work at Fairbanks Station,** C. C. GEORGESON and M. D. SNODGRASS (*Alaska Stas. Rpt. 1917, pp. 28–30, 57–59, 61–70, 85, 86, pls. 3*).—The continuation of work during 1917 along the same general lines as previously noted (E. S. R., 39, p. 125) is described. Continued dry weather resulted in poor germination at the time of seeding and led to the production

of about one-half the normal grain crop. The frost-free period extended over an interval of 118 days.

Practically all the winter grains winterkilled. Varieties of spring wheat, oats, and barley were grown in the field on increase plats and in head-to-row tests. Brief notes on the results secured in each case are presented. Finnish Black oats produced at the rate of 31 bu. per acre for a 21-acre tract, while Canadian produced 54 bu. on a 1-acre tract. In adaptability to climatic and soil conditions H. G. spring wheat, with an average yield of more than 12 bu. per acre for the season, is deemed superior to both Romanow and Marquis, which outyielded it. Japanese buckwheat yielded at the rate of 12 bu. per acre.

Three varieties of field peas were tested, which are said to have produced heavy yields of excellent hay but failed to mature seed.

North Swedish, Cherno, Cossack, and Semipalatinsk alfalfa came through the winter in fair condition. The latter matured some seed. Red clover seeded for soil improvement made a vigorous growth. White clover seeded in 1916 in the lawn came through the winter in fair condition and made satisfactory growth under unfavorable moisture and soil conditions.

Oats grown for hay produced about 1⅓ tons per acre and is said to constitute the principal hay crop of the region. Native bluetop (*Calamagrostis langsdorfii*) is also utilized for hay.

Of the potato varieties grown in increase plats the highest yield, 160 bu. per acre, and best quality tubers were secured from Gold Coin, while in variety tests the yields ranged from 92.2 bu. for Alaska Beauty to 162 bu. for Gold Coin, which was again first in quality. In single-row tests the yields varied from 82 to 182 lbs. per row of 155 ft. for Bliss Triumph and Million Dollar, respectively. Both blight and scab were found to be present to some extent in the region.

The Petrowski turnip is said to be a sure crop for this locality, and to be nearly immune to attacks from the root maggot found in such abundance in Alaska.

Tests with cereals conducted in cooperation with the settlers of the Matanuska and Anchorage-Knik regions are briefly noted.

**Report of [field crops] work at Kodiak Live Stock and Breeding Station,** H. E. Pratt (*Alaska Stas. Rpt. 1917, pp. 73–77*).—This describes the continuation during 1917 of work along the same general lines as previously noted (E. S. R., 39, p. 124). The year as a whole was characterized by a short summer and a long winter with the lowest temperature on record.

Among the cereals tested for hay production the leading varieties were Sixty Day oats, Success barley, and Russian spring wheat. Amraoti is said to have given the best results among the field pea varieties tested. Red clover and field peas responded favorably to inoculation.

Based on limited variety tests with potatoes, Burpee Superior seems to be best adapted to this locality.

Native beach grass (*Elymus mollis*) and a tall beach sedge (*Carex cryptocarpa*) are said to make excellent silage, while native bluetop (*Calamagrostis langsdorfii*) is utilized for silage to a limited extent when the season is unfavorable for hay making. Fireweed (*Epilobium angustifolium*), fast becoming established on the ash-covered flats and to a less extent on the hillsides, is described as making fair silage when mixed with beach grass. Continual cutting greatly reduced the yield of all these plants, while cutting in alternate years only has maintained the yield.

*C. langsdorfii* comprises the principal hay crop of the region, while mixtures of this grass with greater or less amounts of coarse blue grass (*Poa glumaris*),

Kentucky blue grass (*P. pratensis*), and wild barley (*Hordeum boreale*) also make good hay. Chemical analyses of the principal grasses used for hay and silage at Kodiak, previously noted (E. S. R., 17, p. 349), are compared with similar analyses of blue grass, redtop, and timothy. Feeding trials at the station are held to indicate that the native grasses have approximately the same digestion coefficients as similar grasses in the United States.

Report of [field crops] work at Rampart Station, C. C. Georgeson and G. W. Gasser (*Alaska Stas. Rpt. 1917, pp. 21–27, 35–54, 55, pls. 3*).—This describes work conducted during 1917 similar to that previously noted (E. S. R., 39, p. 125). The season is described as generally unfavorable for crop production, having been excessively cool, cloudy, and windy, although the frost-free period, 117 days, was 20 days longer than the 10-year average.

Although *Medicago falcata* and Grimm alfalfa made a vigorous growth, practically no seed ripened. It is stated that the number of bees was markedly reduced this season, and that butterflies, fairly numerous during June, disappeared almost entirely for the rest of the summer. Grimm wintered quite satisfactorily, while Hardy Grimm and Disco have been discarded as lacking in vigor. Obb and Omsk made a rank growth, but their procumbent habit renders them unsatisfactory for hay production. An attempt to inoculate 2-year-old plants with a liquid culture mixed with soil failed to give any results, no nodules being found either on treated or untreated plants.

*Vicia cracca* again gave excellent results, ripening from 50 to 75 per cent of its seed. Well-developed root nodules were observed on both old and new seedings, although no culture had been applied at any time.

A strain of Alaska garden peas grown at the station for 11 years produced at the rate of 27.93 bu. per acre. Root nodules were fairly abundant although no culture had been applied. Irkutsk field peas, sprouted before planting and seeded in rows 20 in. apart, produced at the rate of 15.32 bu. Tests of two varieties of field peas received from the Tulun Experiment Station, Russia, and of several strains of chick peas (*Cicer arietinum*) received from the Office of Foreign Seed and Plant Introduction, U. S. Department of Agriculture, are noted. The field peas ripened some seed, while the chick peas were still green when killed by frost.

Red clover planted as a soiling crop produced an excellent stand, although growing slowly and in spots. Only a few plants were found having root nodules. *Trifolium lupinaster* again proved to be perfectly hardy and produced seed, but its lack of vigor is said to render it almost valueless as a hay plant.

Variety testing and hybridization work with winter wheat and rye, and spring wheat, rye, barley, and oats is noted, and the results secured with each sort briefly outlined. Japanese buckwheat and a strain designated as No. 60–2 produced at the rate of 81.3 and 68.3 bu. per acre, respectively. Millet failed to produce any seed.

A small seeding of hemp resulted in plants ranging from 12 to 40 in. in height, about 75 per cent of the crop ripening seed. Flax attained a height of about 28 in. and ripened about 40 per cent of its seed.

Potatoes grown in the field gave poor results, thought to be due chiefly to the low fertility of the soil, while plantings made on good garden soil proved to be more satisfactory. Irish Cobbler, Early Six Weeks, Netted Gem, and Gold Coin are said to be superior in quality to Burpee Superior, Lake Puritan, and Knowles Big Cropper.

Cotton and corn: Cultural tests, and variety tests of 1917 and 1918, C. K. McClelland (*Georgia Sta. Bul. 128 (1919), pp. 61–78*).—Variety, cultural, and fertilizer tests with corn and cotton are described in a continuation of work

previously noted (E. S. R., 37, p. 35). The total rainfall for the growing season (April to August, inclusive) amounted to 16.92 in. in 1917 and 15.7 in. in 1918, the distribution in the latter season being described as particularly unfavorable to corn.

The corn yields in the 1917 variety test ranged from 17.1 bu. per acre for Experiment Station Henry Grady 1009 to 30.8 bu. for Velvet Cob, and in 1918 from 16 bu. for an early planting of Station Marlboro to 20.1 bu. for Steinheimer Marlboro. Ear-to-row testing of corn is thought to be the only reliable method for determining desirable strains.

Commercial fertilizer placed under corn resulted in an average yield of 15.6 bu. per acre for a 5-year period as compared with 16.8 bu. from similar applications made later around the corn plant. Yields ranging from 20.2 bu. per acre without fertilizer to 26.1 bu. from an application of 1,200 lbs. were secured as a 3-year average, although it is stated that applications of more than 400 lbs. are not economical, while in dry seasons fertilizers in any quantity were seldom profitable.

Planting velvet beans with corn at the time of planting the corn usually reduced the yield of the latter, but the beans are believed to more than compensate for this loss. Deep spring plowing and shallow cultivation the first time appeared to give better results than other methods of cultivating corn. Applying nitrogenous top-dressings early proved to be of greater importance than the kind of nitrogen carrier employed. The residual effect of stable manure practically disappeared in two years during dry seasons.

In the cotton variety tests, the 1917 yields ranged from 1,775 lbs. of seed cotton per acre for Durango (long staple) to 2,820 lbs. for O'Bannon No-chop, and the 1918 yields from 1,237 lbs. for Webber No. 49 to 1,715 lbs. for Steinheimer Cleveland.

The use of varying amounts of commercial fertilizer on cotton resulted in yields of from 978 lbs. for the checks to 1,242 lbs. for a 1,200-lb. application. From 600 to 800 lbs. is deemed sufficient.

In a comparison of early and late chopping of cotton the latter practice resulted in a slightly earlier crop, while the average yields amounted to 1,340 and 1,248 lbs. of seed cotton per acre, respectively, for a 4-year period.

**[Report of work with field crops in Kansas, 1917–18]** (*Kansas Sta. Rpt. 1918, pp. 19, 21–27, 30, 31, 33*).—This describes the progress of work previously noted (E. S. R., 40, p. 329).

Observations on the effect of cutting alfalfa at different stages of maturity showed that the highest average yield, 4.88 tons per acre, for a 4-year period followed the practice of cutting the crop when in full bloom. Plats cut in the bud stage are said to be deteriorating rapidly, the alfalfa being replaced by grass and weeds.

Adverse weather conditions resulted in low yields of corn in 1917. Corn grown continuously since 1910 produced 22.6 bu. per acre, as compared with 44.9 bu. from that grown in rotation with wheat and alfalfa, 32.8 bu. in rotation with cowpeas and wheat, and 22.7 bu. in a rotation of wheat and corn two years. Corn grown in rotation was little affected by applications of commercial fertilizers, although marked results were obtained from their use on corn grown continuously. It is stated that phosphorus may be profitably used on Kansas soils in a low state of fertility which are grown to corn continuously without manure. An annual application of 2.5 tons of manure per acre has resulted in an average increase in yield of corn of 7.93 bu.

Severe winterkilling during January and February resulted in low wheat yields. Average yields following different cropping systems for the 7 years, 1911–1917, were 17.3 bu. in rotation with alfalfa 4 years and corn 2 years, 15.73 bu. in rotation with corn and cowpeas, 13.38 bu. in rotation with corn 2 years, and 14.88 bu. when grown continuously. Wheat grown continuously without manure produced 11.85 bu. per acre in 1917, as compared with 20.5 bu. following annual applications of 2.5 tons of manure. Wheat grown in rotation was little affected by the use of manure or commercial fertilizers. The latter resulted in higher yields for all plats continuously cropped to wheat. With phosphorus there was an increase in yield of wheat of 3.49 bu. per acre in the 3-year rotation, and with a complete fertilizer 7.07 bu. A fertilizer mixture high in phosphorus and containing some nitrogen is deemed best, while potassium has failed to prove beneficial.

While alfalfa yields were low, due to drought during the summer, that grown in rotation produced considerably more than that grown continuously. Manure applied at the rate of 5 tons per acre every 3 years resulted in an increase of about 0.5 ton of hay in 1917. The use of commercial fertilizers resulted in increased yields in every case, but the increase due to potassium is said to be negligible. An application of 180 lbs. of acid phosphate per acre on alfalfa grown in rotation resulted in an average increase of 878.9 lbs. of hay since 1911, while with a complete fertilizer there was an increase of 1,477.5 lbs.

The highest yields of cowpea hay were secured on the plats receiving a complete fertilizer and barnyard manure.

In a rotation of alfalfa, Kafir corn, corn, and oats, the highest yield of alfalfa was secured from the plat receiving manure and rock phosphate. Kafir corn on the check plat produced 18.1 bu. per acre, as compared with 23.8 bu. from the plat receiving fresh manure, 23.4 bu. from fresh manure and rock phosphate, and 25.7 bu. from leached manure.

The highest yields of wheat were secured from the earliest preparation of the seed bed, and, in the case of continuous cropping to wheat, from plats plowed 7 in. deep. Nitrification varied with the amount of moisture available in the soil during the period of seed-bed preparation, while the available moisture supply appeared to be dependent upon the amount of weed growth. Different methods of seed-bed preparation had little if any effect upon the potential efficiency of nitrate-forming organisms, differences in the rate of nitrification being due to differences in the activity of the organisms concerned in the decomposition of organic matter, these in turn being affected by environmental conditions which retard their activity rather than by any differences in bacterial flora. The principal environmental factors involved are said to be the distribution of the organic matter and the availability of the moisture supply. Nitrification was as great in the surface 3 in. of soil as in the 3- to 6-in. level, while in the 6- to 12-in. layer it was less than in the upper layers. Determinations of the amount of weed growth on late-prepared plats and of the nitrogen content of the weeds led to the conclusion that nitrification was as rapid on these plats as on those receiving early tillage. Based on the average yields, it is recommended that if wheat stubble can not be plowed at once after harvest (July 15), the land should be double disked immediately and plowed 6 or 7 in. deep when convenient, but not later than early September, with sufficient cultivation to keep down weeds, and produce a firm seed bed.

Observations were made on the effect on the moisture content and nitrate formation in clay, silt loam, and fine sandy soil of maintaining a 3-in. cultivated mulch and a bare surface. In addition, weeds were allowed to grow

throughout the season on two plats. The results obtained are given in the following table:

*Effect of 3-inch mulch, bare surface, and weeds on the moisture content and nitrate formation in three types of soil.*

| Average determinations, Apr. 1 to Oct. 1, 1917. | Clay. | | Fine sand. | | Silt loam. | | Weeds. | |
|---|---|---|---|---|---|---|---|---|
| | Mulch. | Bare surface. | Mulch. | Bare surface. | Mulch. | Bare surface. | Plat 1 | Plat 2. |
| Percentage of moisture to a depth of 6 ft. | 22.4 | 23.0 | 17.2 | 16.4 | 19.9 | 20.4 | 17.5 | 17.0 |
| Pounds of nitrate per acre-foot to a depth of 3 ft. | 74.5 | 57.6 | 91.4 | 126.1 | 219.2 | 220.3 | 57.0 | 114.5 |

Observations on wheat seedlings grown in soil solutions obtained by leaching, filtering, and centrifuging are held to indicate that Kafir corn and milo maize do not exert a toxic effect upon the soil, even in seasons when Kafir corn has injured the wheat growth, as shown by comparison with corn. Nutrient solutions used in conjunction with water cultures indicated that Kafir corn soil was lacking in available nitrogen. Applications of nitrogen alone on Kafir corn soil resulted in a growth of oats exceeding that secured on untreated corn soil or corn soil with nitrogen. Less moisture and nitrates were found in the soil from the Kafir corn plats than from the corn plats at the time of planting fall wheat, thought to be due to the fact that the Kafir corn produced about twice as much dry matter as the corn.

Kanred winter wheat again demonstrated its superiority over other varieties, averaging 4.5 bu. per acre more than Turkey and 4.7 bu. more than Kharkof for a 7-year period. It also appears to be markedly resistant to cold and to certain strains of black stem rust. Kansas Nos. 2414 and 2415 also proved to be quite resistant to both cold and rust, while Nebraska Hybrid No. 34 was less winter hardy and is deemed unsuited to Kansas conditions.

In a comparison of 87 varieties of small grain, mostly wheat, as to their susceptibility to injury from the Hessian fly, it was found that the fly seldom lays eggs on oats, barley, einkorn, spring emmer, or durum wheat, and less abundantly on soft winter wheats than on hard winter wheats. It was also observed that on certain varieties, notably Illini Chief, Dawson Golden Chaff, Beechwood Hybrid, and Currell Selection, very few flaxseeds developed, although eggs were laid on the plants in abundance.

Wheat seeded in furrows produced on the average 2 bu. per acre more than that seeded in the usual way, while north and south seeding again gave better results than east and west seeding.

The average corn yields on uncultivated plats from which the weeds were removed with a hoe were only 1.1 bu. per acre less than for plats cultivated in the usual way, while summer cultivation gave the lowest yields. Spacing corn 20 in. gave the best results on upland and 16 in. on bottom land as an average for four years.

In a 5-year test of different silage crops, Kansas Orange sorghum, Blackhull White Kafir, and corn produced average yields of 19.2, 12.6, and 12.1 tons per acre, respectively.

Experiments begun in 1915 to determine the possibilities of improving native pasture land by a deferred and rotation system of grazing are said to indicate that the vacant ground is decreasing to a marked degree, that pure grass

is increasing, and that mixed weeds and grass and weeds alone are decreasing on the protected areas. All attempts to seed tame plants have failed, with the exception of sweet clover on protected fields.

Alfalfa stacked green showed a loss of 39 per cent in dry matter, some of the material being badly spoiled. An analysis of the best black silage showed that the moisture content was practically the same as when the material was placed in the stack, that the ash content was considerably increased, that the protein content was greater than in the original hay, and that the percentage of nitrogen-free extract, crude fiber, and ether extract was less. Prolongation of the drying process is said to produce proteolysis, resulting in an increase in amino acids and amids.

[Variety tests with alfalfa and potatoes], E. F. GASKILL (*Massachusetts Sta. Rpt. 1917, p. 32a*).—In variety tests with alfalfa, Grimm again failed to show any superiority over common alfalfa (E. S. R., 38, p. 231). Several seedling potatoes proved to be no better than standard varieties grown in comparison with them.

[Report of work with field crops in New Jersey], F. APP and C. S. VAN NUIS (*New Jersey Stas. Rpt. 1917, pp. 313–315, 329–331*).—In continuation of work previously noted (E. S. R., 39, p. 736), the progress of studies regarding the source of seed, time of seeding, and cultivation of alfalfa, methods of seeding sweet clover, and the selection of seed corn for silage production is briefly described, together with a report of the department of farm crops relative to the acreage and yields on the experiment station farm of corn for grain and silage, rye for grain and straw and as a soiling crop, alfalfa for hay, oats and peas for silage and hay, timothy for hay, and soy beans for green manuring.

Alfalfa seeded on April 11 with wheat as a nurse crop gave much better results than that seeded without a nurse crop. Plats seeded June 7 were more weedy than those seeded April 11 without a nurse crop, while seedings made August 14 appeared to be in fair condition for the winter but with small growth. Cultivation is deemed undesirable for alfalfa.

Seeding sweet clover with wheat as a nurse crop early in the spring (the latter part of February or early March) is said to have resulted in a vigorous crop.

Selecting silage corn seed from the standing stalk is believed to be highly desirable, results secured in the 1917 crop indicating that selected seed was superior to purchased seed in germination and that the plant could be modified to meet the dairyman's needs.

Progress report, substation No. 11, Nacogdoches, Tex., 1909–1915, G. T. MCNESS (*Texas Sta. Bul. 237 (1918), pp. 5–27, figs. 4*).—The Nacogdoches substation, located in the east-central part of the State, was established in 1903 primarily for the purpose of conducting tobacco investigations in cooperation with the U. S. Department of Agriculture. This bulletin has to do chiefly with the progress of the work since 1911. Meteorological data are presented for the region, indicating that the growing season is comparatively long and the average annual precipitation is 48.5 in. The principal lines of work comprise fertilizer experiments with tobacco, supplementing work previously noted (E. S. R., 27, p. 37); variety and cultural tests with corn, cotton, cowpeas, soy beans, peanuts, Sudan grass, and Japanese cane; field tests with several other leguminous and nonleguminous forage crops; variety tests with seven different truck crops, and fertilizer tests with tomatoes. The results secured may be briefly summarized as follows:

Cottonseed meal with other materials and in rather large amounts seemed to be the most effective agent used in fertilizer tests with tobacco, while smaller amounts were effective for other crops than tobacco.

Surecropper and Strawberry corn are recommended for uplands and the so-called prolific varieties for the bottom lands. Rate of seeding tests with corn are held to indicate that the stalks should be thinned to 3 by 3 ft. In a comparison of corn grown alone with corn and cowpeas grown together, better results were secured the later the cowpeas were planted.

The largest yields of cotton have been secured from hills spaced from 18 to 36 in. apart, containing two stalks per hill. Mebane, Rowden, and Lone Star are deemed to be the best varieties.

Clay and New Era cowpeas are said to be suitable for general use, while Chinese Red is recommended as a catch crop and Iron for forage. Wide row planting has given more cowpea hay than narrow row planting, while heavy seeding has given larger crops than light seeding.

Soy beans do not appear to be profitable.

Peanuts in 18-in. rows have not shown a profitable gain over 36-in. rows when grown for nuts. Spanish peanuts are recommended for forage. In width of row tests with this variety 36-in. rows produced more forage than 18-in. rows. It was not found profitable to crack the shells of peanuts before planting.

Sumac sorghum is recommended as a silage crop. Among new forage crops tested each year, Kulthi moth bean, Florida beggar weed, Japanese sword bean, and frijole bean are of little importance, while mung bean and *Dolichos lablab* proved to be of some value.

Sudan grass, newly introduced, is of considerable importance as an annual hay and pasture crop. In date and rate of planting tests with Sudan grass the results are held to indicate that rather late spring planting is necessary or that early planting after oats is practical. It is advised that the crop be planted in rows at from 5 to 15 lbs. of seed to the acre.

Japanese sugar cane gives promise as a silage crop.

The largest yield of tomatoes has been obtained from plats receiving 20 loads of stable manure per acre.

**A study of environment in small grains.** B. D. HALSTED (*New Jersey Stas. Rpt. 1917, pp. 394, 395*).—This comprises a brief preliminary report on work with wheat, oats, barley, and buckwheat, comprising a study of the influence of the position of the grain on the plant upon the viability of the grain and the vigor of the seedling, of the effect of the depth of planting upon the viability of the seed and the weight of the plants produced, and the effect of the number of plants per hill upon the weight of the plant.

Seedings were made 1, 2, 3, 4, and 5 in. deep and the average weight of the plants and the percentage of plants harvested at each depth ascertained. The highest average weight per plant for wheat and oats was secured at the 5 in. depth and amounted to 99.5 and 280 gm., respectively, while the maximum weight for barley, 144 gm., and for buckwheat, 68.1 gm., was secured at the 4 in. level. The viability of wheat and oats increased from the 1 to the 3 in. depth and then declined, while barley attained its maximum at the 1 in. depth, and buckwheat at the 4 in. depth.

Planting 1, 3, 5, 10, and 20 grains per hill resulted in maximum average weights per plant of 85.3 gm. for wheat at the 5 grain rate, 410.6 gm. for oats at the 1 grain rate, 149.3 gm. for barley at the 1 grain rate, and 98.8 gm. for buckwheat at the 20 grain rate.

**Spring grains in western Nebraska.** L. L. ZOOK (*Nebraska Sta. Bul. 172 (1919), pp. 16, figs. 4*).—Experimental work is described in which observations were made on the effects of different dates of seeding and on the relative yields of spring grains, including wheat, oats, barley, and emmer, at the North Platte substation for the 10 years, 1909 to 1918, inclusive. A previous report on this work has already been noted (E. S. R., 29, p. 225).

The average seeding dates were March 25, April 6, 18, and 30. The average precipitation for the 10-year period was 18.77 in., or slightly less than the 44-year average for the substation. A comparison of the monthly precipitation for each year of the experiment with the crop yields is held to indicate that the distribution of the rainfall, together with the moisture condition of the soil in the spring, is sometimes of greater importance than the total amount of precipitation in determining yields. The results obtained may be summarized as follows:

With the exception of two years, early seedings produced the best yields, while the average yields of all crops were materially higher with early than with late seeding. Differences between early and late seedings of barley and oats were less marked than with wheat and emmer. Barley outyielded all other crops, and on account of the length of the season in which it can be successfully seeded, its high feeding value, and high yields, it is recommended for more general planting. The lowest yields were secured from emmer, and the growing of this crop in the western part of the State is said to be scarcely justifiable. There appeared to be little difference between spring wheat and early oats, either as feed or cash crops. It is stated that weed growth usually proved to be less troublesome in early than in late seedings.

**Farm pastures in Montana**, A. Atkinson (*Montana Sta. Circ. 82 (1919), pp. 61–67*).—Methods of seeding both dry-land and irrigated pastures in the State for summer pasture and feed are briefly described and suitable seed mixtures recommended.

**A bad farm practice**, W. E. Ayres (*Arkansas Sta. Circ. 47 (1919), pp. 4, fig. 1*).—Observations made at the Scotts Branch substation in 1918 on the effect of delayed harvesting on the yield and quality of three varieties of cotton are said to indicate that an average loss was sustained amounting to 11.1 per cent in yield and 33.6 per cent in the value of lint and seed. It is estimated that the total annual loss in the State due to late harvesting varies from 3¾ to 5½ million dollars. Increased production of food and feed crops in the South, accompanied by a limitation of the acreage planted to cotton to that which can be harvested at the proper time, is urged.

**Napier and Merker grasses, two new forage crops for Florida**, J. B. Thompson (*Florida Sta. Bul. 153 (1919), pp. 237–249, figs. 7*).—Napier grass (*Pennisetum purpureum*), also known as elephant grass, Napier fodder grass, Zinyamunga, Carter grass, and bamboo grass; and Merker grass (*P. merkeri*), recently introduced into Florida, are briefly described and their production and utilization in the State discussed. Napier grass is said to be indigenous to tropical Africa and Merker grass to South Africa, and to have been introduced into this country by the U. S. Department of Agriculture in 1913 and 1916, respectively.

Napier grass is described as a rank, vigorous grower, attaining a height of from 6 to 12 ft. or more; growing readily from seed, root divisions, or cuttings of mature cane; and giving promise for the region embracing all of Florida, the southern portion of Mississippi, Louisiana, and Texas, southwestern Arizona including the Salt River Valley, and certain portions of California. The green feed is said to be highly palatable if harvested at the proper time and to contain a relatively large amount of protein. The best results have been secured with Napier grass on a moist, fertile soil, although it has proved fairly successful on rather poor land as well and is quite drought resistant.

Merker grass is said to be similar to Napier grass in general character and agricultural value.

**Field pea production in north Idaho**, H. W. Hulbert (*Idaho Sta. Bul. 115 (1919), pp. 3–27, figs. 3*).—Field practices and cultural methods deemed best for

growing the crop in the northern part of the State are indicated from observations at the station and elsewhere, and the comparative yields of different varieties and results of cultural tests are reported. It is stated that 24,722 acres were devoted to field pea production in 1918, an increase of 15.5 per cent over the 1917 crop. About 50 per cent of the crop was grown in two northern counties in place of the summer fallow.

Blue Prussian has given the highest returns in market value and White Canada the highest yield per acre. Inoculation was found to be essential. Wheat following peas is said to yield equally as well as that after summer fallow. Important insect pests of the crop are briefly described.

**Position in the pod and productiveness; seed weight and abortiveness: Peanuts**, O. C. SCHULTZ (*New Jersey Stas. Rpt. 1917, pp. 401–404*).—Further observations with peanuts (E. S. R., 39, p. 739) on the effect of the position of the seed in the pod upon the type of pod produced, the average weight of seeds for different positions in the pod, and the amount of abortiveness for each type of pod are briefly described.

The results are held to suggest that seeds from 1-seeded pods may yield the largest number of pods and those from 4-seeded pods the smallest crop. Seeds from 1-seeded pods also produced the largest percentage of 1-seeded pods, this percentage decreasing as the number of seeds in the parent pods increased, indicating a possible inheritance of pod type. The seeds of 1-ovuled pods were the heaviest, while the basal halves of all other pods contained heavier seeds than the upper halves. The seeds of the 4-ovuled pods were on the average the lightest, the number of 5-ovuled pods being too few for consideration. All basal seeds averaged much heavier than the tip seeds.

Abortiveness was lowest in the 1-ovuled pods, 11.61 per cent, and highest at the base of all other pods, the percentage increasing from 36.95 for the 2-ovuled pods to 60 per cent in the 5-ovuled pods. There was a positive correlation between the size of the seeds and the amount of abortiveness, the basal position in all pods yielding the larger seeds and the greater amount of abortiveness, both of these results depending upon the position of the ovules.

**[Work with potatoes at the Sitka Station]**, C. C. GEORGESON (*Alaska Stas. Rpt. 1917, pp. 6–8*).—This describes the progress of variety tests with potatoes and efforts to develop new sorts from seed, as previously noted (E. S. R., 39, p. 137). It is stated that by selecting early varieties, sprouting the seed potatoes in the light before planting, and planting on elevated ground, preferably with a southern slope, excellent crops of good quality potatoes can always be secured in Alaska, even north of the Arctic Circle.

**An improved method of potato seed treatment**, I. E. MELHUS and J. C. GILMAN (*Iowa Sta. Circ. 57 (1919), pp. 8, figs. 10*).—A modification of the formaldehyde treatment for seed potatoes is described whereby the tubers are immersed for 2 minutes in a solution of 2 pints of formaldehyde to 30 gal. of water maintained at a temperature of from 118 to 122° F. The hot solution is said to have had no deleterious effect upon germination, as indicated by field tests made during the past 3 years.

**Control of weeds in rice fields**, H. H. LAUDE (*Texas Sta. Bul. 239 (1918), pp. 5–11, figs. 2*).—Tests conducted at the Beaumont substation from 1914 to 1917, inclusive, have led to the conclusion that planting rice in rows and cultivating the crop before irrigating will effectively control the weeds, increase yields, result in cleaner land with each succeeding crop, and lengthen the period of profitable rice production. It is also recommended that narrow, steep levees be replaced by broad, sloping ones, and that only pure seed be employed for planting purposes.

**Sugar beets under irrigation in Washington**, F. J. Sievers and E. G. Schafer (*Washington Sta. Bul. 154 (1919), pp. 41, figs. 11*).—This comprises a general discussion of the principal factors affecting the successful production of the crop in the State, together with information relating to diseases and insect pests.

**Strains of White Burley tobacco resistant to root rot**, J. Johnson and R. H. Milton (*U. S. Dept. Agr. Bul. 765 (1919), pp. 11, figs. 4*).—This comprises a rather popular account of the nature of the root-rot disease of tobacco, said to be due to *Thielavia basicola*, together with a brief discussion of the development and testing of resistant strains of White Burley. It is stated that two or three resistant strains of the drooping-leaf type are suitable for use on "sick" soils, while promising results have also been secured with the stand-up type.

**The velvet bean**, C. K. McClelland (*Georgia Sta. Bul. 129 (1919), pp. 81–98, figs. 6*).—Directions are given for growing, harvesting, and utilizing velvet beans as a companion crop with corn in Georgia, together with the results of limited variety tests, including agronomic data on the different varieties. It is stated that the crop is valuable for pasture, grain, feed, roughage, smothering weeds, silage, and soil improvement, especially on sandy soil, and that the feeding and fertilizing value of velvet bean meal is equivalent to about one-half of a like weight of cottonseed meal. The Florida, Georgia or Early Speckled, Alabama or Medium Early Speckled, Chinese, Osceola, Yokohama, and Lyon are said to be the best known varieties.

**Velvet bean varieties**, J. M. Scott (*Florida Sta. Bul. 152 (1919), pp. 213–233, figs. 10*).—Varieties of velvet beans grown in Florida are briefly described and illustrated including the Florida, Lyon, Yokohama, Chinese, Georgia or Early Speckled, Wakulla, Osceola, and Alachua. Directions are also presented for the production and utilization of the crop in the State.

Velvet beans grown continuously for 6 years showed a decrease in yield of from 25 bu. of shelled beans per acre in 1907 to 10 bu. in 1912, or an average of 15 bu. (for 5 crops), as compared with a similar average of 23 bu. per acre for the general crop.

**Wheat investigations—varieties**, A. E. Grantham (*Delaware Sta. Bul. 121 (1919), pp. 3–49, figs. 2*).—This describes a study of winter wheat varieties conducted from 1908 to 1917, inclusive, the results of which may be summarized as follows:

Of 56 varieties grown in drill plats for 9 years the leading sorts were Auburn Red with 37.2 bu. per acre, Red Wonder with 32.54 bu., Sibley New Golden with 31.75 bu., Valley with 31.32 bu., and Mediterranean with 30.81 bu., while of 53 varieties grown by the hill-plat method for 3 years the best results were secured from Lebanon with 32.05 bu., Auburn Red with 31.5 bu., Dietz Amber with 31.13 bu., Poole with 31.05 bu., and Fulcaster with 30.9 bu. The best yielding varieties of smooth wheats were Golden Bronze, California Red, and Dawson Golden Chaff with 28.68, 28.46, and 28.23 bu. per acre, respectively. Based on the yields of bearded and smooth wheats for 26 tests, including 1,986 varieties and strains the former outyielded the latter by 3.31 bu. per acre. Grown both with and without fertilizer the bearded kinds produced better than the smooth. The shrinkage in yield of the bearded wheats when grown without fertilizer was 30 per cent, and of the smooth wheats 41 per cent.

**Fifth annual report of the Montana grain inspection laboratory**, A. Atkinson, E. W. Jahnke, and C. R. Haller (*Montana Sta. Bul. 127 (1918), pp. 45–59, figs. 8*).—The activities of the laboratory for the year ended October 1, 1918, are briefly described. A total of 635 samples of wheat were tested for

grade, dockage, moisture, etc., during the year ended July 1, 1918, while 12,694 samples of various kinds of seeds were tested for germination and purity.

Test your clover and timothy seed, C. M. KING and L. H. PAMMEL (*Iowa Sta. Circ. 59 (1919), pp. 2*).—Legal standards of purity and germination for alfalfa, alsike and red clover, and timothy seed in Iowa are presented and the value of good seed emphasized. Germination tests of timothy and alsike clover seed alone and in alsike and timothy mixtures are held to indicate that inferior seed is often employed in such mixtures.

Results of seed tests for 1918, F. W. TAYLOR (*New Hampshire Sta. Bul. 188 (1918), pp. 15*).—This bulletin contains a report on the purity and germination of 280 official samples of agricultural seed collected during the year ended July 1, 1918. It is stated that of the samples guarantied for purity 95 per cent were up to or above the guaranty while only 63 per cent of those guarantied for germination equaled or surpassed the guaranty. Alfalfa, alsike clover, corn, peas, oats, red clover, timothy, and wheat were found to be on the average above the standard for purity, while Barley, buckwheat, millet, redtop, and white clover were below the standard. With regard to germination, all seeds were up to standard except corn, millet, peas, and red and white clover.

The amended text of the New Hampshire seed law is included.

The composition of some lawn-grass mixtures, J. P. HELYAR (*New Jersey Stas. Rpt. 1917, pp. 208, 209*).—A tabulated statement is presented showing the composition of 40 different mixtures of grasses and clovers recommended for seeding lawns and examined in connection with the regular seed inspection (E. S. R., 39, p. 842). It is stated that little uniformity exists, either in the kind or the proportions of seed employed in such mixtures by various dealers and that the mixtures sometimes consist of medium or low grade lots of seed.

Johnson grass as a weed in southwestern Iowa, L. H. PAMMEL and C. M. KING (*Iowa Sta. Circ. 55 (1919), pp. 4, figs. 3*).—The appearance of the weed in the southwestern part of the State is noted, brief descriptions of the plant and seed presented, and its distribution and methods of eradication indicated. Converting infested fields into close-cropped meadows or pastures for one year, followed by shallow cultivation during midsummer and clean culture until frost, is deemed to be the best means of exterminating the pest.

## HORTICULTURE.

[Horticultural investigations in Alaska], C. C. GEORGESON, G. W. GASSER, and M. D. SNODGRASS (*Alaska Stas. Rpt. 1917, pp. 8–21, 27, 28, 54, 55–57, 70, 71, 86–90, pls. 2*).—A progress report on varietal and cultural experiments with fruits, vegetables, and ornamentals at the Sitka Station and at the branch stations, together with the usual extracts from letters of settlers and others regarding results obtained from the seed and plant distribution and other plantings.

Orchard fruits have thus far failed to make much headway. So far no variety of apples has been discovered that can be said to be at home in the climate. A number of apples of several varieties matured at Sitka in 1915, a favorable season, the Yellow Transparent and the Livland Rasberry being the leaders. Several small trees have been grown from scions received from Finland, which it is hoped will do well in southeastern Alaska.

Notes are given on recently tested ornamentals, shrubs, and perennials, including a selected list of perennials which have proved hardy and dependable for the coast region.

The breeding work with strawberries was continued at the Sitka Station, although the season was unfavorable for determining the value of the seedlings. Two hybrid strawberries originated at the Sitka Station have proved entirely hardy at Rampart with no protection other than that afforded by the snow. They fruited abundantly for a period of six weeks, producing large, luscious berries.

The first two apples ever matured in interior Alaska were grown on a Siberian crab at Rampart during the past season. Of a lot of a dozen of these trees and other hardy apples sent to the Rampart Station about 12 years ago only three trees are now alive, all Siberian crab. The tops are killed down to snow line each winter.

[Report on horticultural investigations] (*Kansas Sta. Rpt. 1918, pp. 35, 56*).—A brief statement of progress made during the year. Summing up the results for three seasons, the station's tests show clearly that it is impracticable to prune and stake tomatoes when growing them on a commercial scale, as increase of production does not offset the cost of pruning and staking. This season's work confirms the wisdom of using some crop, usually either wheat or corn, which makes a heavy demand on the soil, between alfalfa and potatoes. Fall plowing has proved to be helpful in the control of potato diseases. It is suggested that this may be due to the fact that the soil is in better condition and better germination is secured.

Continued experimentation in orchard soil management justifies the conclusion that alfalfa and permanent sodding must be abandoned in order to control the buffalo tree hopper (*Ceresa bubalus*). On the other hand serious washing of the glacial soils, even where cultivation is along the contour lines, indicates the need of cover crops. Cowpeas and oats are being tested for this purpose. Orchard pruning experiments continue to show the superiority of two prunings, summer and winter, over a single pruning or neglected pruning. A large number of fruit buds were produced on 5-year old and 6-year old apple trees which were pruned for the 2 years preceding.

Report of the department of horticulture, M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1917, pp. 79–104, pls. 2, fig. 1*).—A progress report on horticultural investigations in 1917, continuing previous work (E. S. R., 39, p. 745), and including observations on peach borers and on peach yellows and little peaches abstracted on pp. 57 and 54, respectively.

The season's results from the peach-pruning experiment in the Vineland orchard indicate that the summer pruning of the tips of the branches in late June and early July delays the maturity of the fruit. Summer pruning thus prolongs vegetative action instead of checking it, as is commonly believed. The fertilizer experiments in the Vineland orchard, which have run for 10 years, are now to be discontinued, and the results will be published.

In the peach-breeding work, additional plantings of seedling peaches from known parents were made on the recently acquired Wolpert farm, and pits from crosses made in 1916 were planted in nursery rows. A small orchard of standard varieties used in the breeding work, as well as other standard varieties and promising seedlings, was planted in 1917. An experimental grape vineyard and a new planting of apples has been started on the Wolpert farm.

Cultural and variety tests with roses and carnations were continued. In the breeding work with carnations, several seedlings producing purple flowers of good form appeared. Several red seedlings and one red and white variegated seedling also are very promising.

A strain test of Earliana tomatoes was started during the year, and the strain test of beets was continued. The usual records of blooming date of fruit

trees and ornamentals as well as weather observations for the year are reported.

Studies on heredity and environment, B. D. HALSTED (*New Jersey Stas. Rpt. 1917, pp. 372–394*).—Studies on heredity and environment (E. S. R., 39, p. 746) were continued with corn, beans, soy beans, peas, and tomatoes.

Several $F_1$ corn crosses were tested to determine the relation of ear type in the $F_1$ to the character of the following crop. Some results are given for two crosses, but no general deductions have thus far been made from the accumulated data.

Six types of corn kernels were used in a test of the influence of depth of planting upon viability of the seeds and vigor of the plants. Samples of the corn were planted at depths ranging from 1 to 8 in. The number of kernels failing increased uniformly to 4 in., rose rapidly to nearly 50 per cent at 6 in., and still more rapidly at the maximum depth of 8 in., where the viability was only 28.7 per cent. Large kernels were more viable at great depth than small kernels, and field corn was more viable than sweet corn. The several depths did not seem to exert much influence upon the length of the stalks. Suckers were more numerous in the deeply planted rows and next in the shallow planted rows. Suckers were more numerous in rows planted with floury kernels than with rows planted with either flinty or sweet kernels. Sweet corn suckered least. Suckers were more numerous from large grains at each depth.

With five varieties of beans planted at depths of from 1 to 4 in., there was a large decrease in plants from the 3-in. depth and still more from the maximum depth. The 1-in. depth gave somewhat more plants than the 2-in. depth. Similar differences were noted in the percentage of seed viability. The number of pods per plant did not vary greatly among the four depths of planting. The Henderson Lima beans gave the greatest yield from seed planted 3 in. deep, whereas the four varieties of field beans tested declined in yield as the planting depth increased. The viability of soy beans was nearly the same for all depths excepting the 4-in. depth, where it was only 56 per cent.

Some results are given of a preliminary test conducted with soy beans to determine whether a somewhat constant relationship exists between the position of the seed in the pod and its weight, size, and value for cropping. The largest crop of pods came from the seeds borne at the tip of 3-seeded pods and the lowest yield from seeds at the base of the same pods. Seed from 2-seeded pods averaged the highest yield of pods, and seed from 1-seeded pods the lowest. A high percentage of 1-ovuled 1-seeded pods was associated with the crops from 1-seeded pods and the basal ends of 3-seeded pods. The highest percentage of 2-ovuled 2-seeded pods was associated with the crops from 2-seeded pods with both the basal and tip seeds. The highest percentage of 3-ovuled 3-seeded pods was associated with the crops from tipped seeds of 3-seeded pods. The test indicates that, if possible, it might be well before planting to eliminate the basal seeds from the 3-seeded pods and all 1-seeded pods.

The yield of seeds was best in the 3-seeded tip crop and poorest from the 3-seeded basal crop. For pods as a whole the best average yield of seed was from the 2-seeded pods and the poorest from the 1-seeded pods. Among the full pods the heaviest seed was in the 1-seeded pods, the weight diminishing as the pods increased in number of seeds. In pods containing more than 1 seed the tip seeds were heavier than those at the base. In 3-seeded pods the middle seed was somewhat heavier than the tip seed. Abortiveness was much more frequent in the basal ovules than in the tip ovules, and was in positive correlation with weight of seed.

Some data are given on a similar study of two widely different varieties of Lima beans, the Henderson representing the type with small thin-walled pods bearing small seeds, and the Burpee having comparatively large thick-walled pods and large seeds. The seeds in the basal position were lightest in all types of pods in both varieties, while those of the middle position of 3 and 4 ovuled pods were somewhat heavier than those at the tip. The position giving the lightest seeds within a given type of pod yielded the largest number of abortive ovules. No planting tests were conducted with these seed.

A test was conducted with 100 plants of the New Wonder bean with the view of determining the relation of period of growth of plant to pods and seeds. The percentage of pods having 1 or more ovules aborted was very large and increased from the first to the last picking. Pods picked during the midseason had the greatest number of seeds, and those picked during the latter part of the season the lowest. The heaviest seeds were found in the last picking and the lightest in the midseason picking. In 4-ovuled pods seed weight gradually increased from the base to the tip of the pod. In pods with more than 4 ovules seed weight appeared to be greatest near the middle of the pod. Abortiveness was highest in the midseason pods and lowest in those of the last picking. Within the type of pod the greatest percentage is in the 3-ovuled pods and decreases with the increase in the number of ovules per pod.

Some data are given on a study of the weight of tomatoes as related to position in the cluster. With one exception the basal fruits were heaviest and the terminal fruit lightest.

A number of pea vines were examined to determine the relation between the section of plant to the character of pod and seed. The results of the test, as a whole, indicate that the first pods to form upon all vines of the Alaska type had a larger number of ovules than those formed later. The middle section of the plant produced the largest number of the pods and the heaviest seeds with far the lowest percentage of abortiveness. The abortiveness is chiefly in the basal tip position of the pod.

**The breeding of vegetable fruits**, E. J. Owen (*New Jersey Stas. Rpt. 1917, pp. 396–401*).—In continuation of previous work (E. S. R., 39, p. 746) notes and data are given on character transmission in bean, eggplant, muskmelon, and tomato crosses.

**Spray and practice outline for fruit growers**, H. J. Eustace and R. H. Pettit (*Michigan Sta. Spec. Bul. 93 (1919), pp. 32, figs. 6*).—This bulletin contains general directions for the spray treatment of various orchard and small fruits and vegetables, including instructions for the preparation of sprays, dusts, and other poisonous mixtures.

**Analyses of materials sold as insecticides and fungicides during 1918**, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 333 (1918), pp. 3–16*).—The usual report on analyses of samples of insecticides and fungicides collected in the State.

**Sod, tillage, and fertilizers for the apple orchard.—A 10-year summary**, J. H. Gourley (*New Hampshire Sta. Bul. 190 (1919), pp. 3–40, figs. 6*).—A further contribution to the long-continued orchard management investigation being conducted at the station (E. S. R., 38, p. 345), in which is presented a 10-year summary of the more practical results of various cultural and fertilizer treatments, such as yield and growth of the trees and size of fruit in the different plats.

Trees growing in sod have not yielded sufficiently well to warrant the use of the land for orcharding. They have made such inferior growth most seasons

that they were less able to withstand the destructive influences of weather and parasites. Clean cultivation, without the use of cover crops, has proved to be a successful method in the reclamation of a run-down orchard, increasing the yield nearly 100 per cent and increasing the growth and general vigor of the trees. At the end of the 10-year period, however, the trees were not making as good an average growth as at the end of the 5-year period, indicating that this treatment could not be continued over a longer period of time.

Tillage with cover crops every other year resulted in decided benefit to the trees, but was less satisfactory than annual tillage either with or without cover crops. Annual tillage with cover crops has proved to be a slightly better system to follow than clean tillage, and has given practically as good results as any treatment followed. The cover crops, however, show decided evidence of the need of additional fertility, and the trees in this plat are somewhat less vigorous than during the earlier years of the experiment. Commercially the annual tillage on the cover crop plat has been the most profitable plat in the orchard, and this system is recommended for the run-down orchards throughout the State.

The fertilized plats have failed to respond to either treatment in yield of fruit, as they have made very slight gains. They have responded better in growth, which was not distinguishable, however, until after the sixth year when the larger size of trees was noticeable, and also the darker green color of the foliage. There was no preponderent difference in favor of any of the combinations of complete fertilizer used in the different plats. The combination richest in potash has given the largest apples throughout the experiment, the general quality of the apples being perhaps somewhat better than in the fertilizer plats. Lime has had no obvious effect upon this orchard.

The experiment, as a whole, shows in a most emphatic way the importance of selecting a proper site for an orchard, since the losses from frosts and freezes in a poorly located orchard are disastrous. This experiment indicates that an apple orchard receiving a good system of cultivation responds slowly to the use of chemical fertilizers. In other soils and under other conditions the response might be more marked. It is pointed out that other experiments which will shortly be reported upon show that it is usually necessary to fertilize an apple orchard which is not being cultivated, and that returns are almost immediate in that case. The author recommends that the orchardists of the State apply fertilizers at about the following rate per acre as a trial before they make general use of them: 150 lbs. nitrate of soda, from 200 to 300 lbs. acid phosphate, and from 50 to 100 lbs. sulphate or muriate of potash.

**Fertilizer tests for strawberries.—Summary of results of experiments, extending over three years, on a red-shot Parkdale loam,** G. G. Brown (*Oregon Sta. Bul. 159 (1919), pp. 15, figs. 3*).—A series of fertilizer tests were conducted during the seasons 1916–1918, inclusive, in which nitrate of soda, superphosphate, and sulphate of potash were applied, both alone and in combination. The applications were made chiefly in the spring. A late summer application was made in 1917 to determine its value as compared with spring applications.

The results of the test, as a whole, indicate that for the particular soil involved nitrogen was more beneficial than either phosphoric acid or potash. At the same time plants receiving large quantities of nitrate during 1917 and 1918, when the weather was extremely warm during a large part of the picking season, produced berries which were inclined to be soft. Plants receiving applications of sulphate of potash produced somewhat firmer, but not more attractive berries. During 1916 when a long, cool picking season prevailed there was practically no difference between the firmness, size, or appearance of fruit from any of the plats.

Applications of complete fertilizers, although showing increased yield over check plats, were less beneficial than applications of nitrate alone. It is pointed out, however, that on the lighter soils, especially where water-holding capacity and fertility are often poor on account of lack of humus, commercial fertilizers should not be used to the exclusion of green manures, stable manures, etc. Summer applications of fertilizers appear to possess considerable merit as compared with those made in the spring. Where combined fertilizers were used, late summer applications gave somewhat larger berries than spring applications of similar fertilizers.

**Currants and gooseberries**, G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 1024 (1919), pp. 40, figs. 26*).—This discusses the essential features of currant and gooseberry culture, the selection of varieties, uses of the fruit, and the regions in which these plants may be grown. Certain restrictions on their culture due to such insect pests and diseases as the currant maggot and blister rust, have been pointed out.

In view of the fact that blister rust, so destructive to white pine trees, passes one stage of its growth on currants and gooseberries, it has been found necessary to destroy all currant and gooseberry bushes in certain areas, and to prohibit the further planting of them in certain areas representing valuable lumber interests. The laws which have been enacted by the several States to this end and the Federal quarantine regulations respecting the interstate shipment of currant and gooseberry plants and pine-tree nursery stock are here explained.

**The avocado in Guatemala**, W. POPENOE (*U. S. Dept. Agr. Bul. 743 (1919), pp. 69, pls. 23*).—An account of the avocado in Guatemala, with reference to its importance, extent of culture, popular uses, and types of avocados grown. Avocado culture in the Guatemalan highlands is discussed with reference to the origin of choice varieties, soils, growth and habits of the tree, cultural practices, regularity of bearing, yield, season, picking, ripening, and marketing the fruit, variation in fruits, climatic conditions in the principal avocado regions, hardiness of the avocado, and enemies of the avocado.

An account is also given of the coyo, a distinct species of Persea resembling the avocado, which possesses a distinctive and agreeable flavor and is considered superior to the avocado in some parts of Guatemala. Some 23 Guatemalan avocados, introduced by the Office of Foreign Seed Plant Introduction into the United States for trial in California and Florida, are described.

**Vanilla.—A promising new crop for Porto Rico**, T. B. MCCLELLAND (*Porto Rico Sta. Bul. 26 (1919), pp. 32, pls. 3, figs. 4*).—This bulletin embodies the results of investigations conducted by the station for several years with a view to establishing the vanilla industry in Porto Rico.

Introductory considerations deal with the general status of the vanilla industry and market prospects. The history is given of the experimental planting at the station, including directions for starting a vanillery, propagation, shading, care of plantation, methods of hand-pollinating the blossoms, picking, curing, and preparation for market.

The experiments conducted at the station have resulted in the production of vanilla beans pronounced by dealers as excellent in quality. The crop from a small plat, which was marketed at less than four years from the time the cuttings were set, averaged about ½ lb. cured beans per fruiting vine. The gross returns from the sale of this crop were at the rate of a little less than $400 per acre. In the following year the yield increased to ½ lb. cured beans per vine, and the estimated gross returns based on samples submitted to dealers was from $700 to $900 per acre. In the third harvest year the crop from these

and younger vines on a one-tenth acre plat amounted to 36.44 lbs. and sold for $109.31.

It is pointed out that vanilla growing should not be undertaken by anyone who is unwilling or unable to give the requisite attention to the crop, since the various operations require a considerable expenditure of time, care, and money.

The industry is specially recommended for such districts as are accessible only by poor roads over which bulky and more perishable products can not be carried.

**Planting the rural school grounds**, C. P. HALLIGAN (*Michigan Sta. Circ. 36 (1919), pp. 4, fig. 1*).—Concise suggestions are given relative to the use of native plants, preparation of planting plans, where to plant, and rules for planting. A list is given of native plants that may be available in neighboring fields for improving the rural school grounds.

## FORESTRY.

**Trees of Indiana**, C. C. DEAM (*Indianapolis: Ind. State Bd. Forestry, 1918, 2. ed., pp. 299, figs. 126*).—This is a reprint of a part of the 1911 Report of the State Board of Forestry, to which has been added a few notes and corrections. All the woody plants of the State that usually attain a diameter of 10 to 15 cm. (4–6 in.) have been included, and also a few that rarely attain this size in Indiana. Each tree is considered under the heads of botanical description, distribution, economic uses, and horticultural value.

**Geologic history of the locust and its allies**, E. W. BERRY (*Plant World, 21 (1918), No. 11, pp. 284–298, figs. 2*).—This paper discusses the geologic history of the black locust (Robinia), the honey locust (Gleditsia), the Kentucky coffee tree (Gymnocladus), and the Judas-tree (Cercis).

[**Progress report on forestry investigations**] (*Kansas Sta. Rpt. 1918, p. 36*).—The station is emphasizing the desirability of increasing the planting of red cedar and black walnut, these species having shown under Kansas conditions their superiority as windbreaks, ornamentals, and shade trees. Recent investigations also show the bull pine to be a valuable ornamental tree which has heretofore received too little attention in the State.

**Waipoua Kauri Forest, its demarcation and management**, D. E. HUTCHINS (*Wellington, New Zealand: Dept. Lands and Survey, 1918, pp. 63, pls. 6*).—This comprises the results of a survey of the Waipoua Kauri Forest reserve in New Zealand, with special reference to the demarcation and management of kauri forests.

**Observations on distribution of forest tree pollen**, H. HESSELMAN (*Meddel. Stat. Skogsförsöksanst., No. 16 (1919), pt. 2–3, pp. 27–60, figs. 3*).—A review of the literature on this subject, including some data on observations made by the author relative to the distribution of pollen from spruce, pine, and birch trees.

Pollen was collected on prepared surfaces on two lightships, one 30 km. (18.6 miles) from land and the other 55 km. from land. Spruce pollen grains were collected at the rate of 6,961, birch 6,811, and pine 2,390 grains per square millimeter on the ship nearest shore; and at the rate of 4,089, 3,649, and 1,069 grains per square millimeter, respectively, for spruce, birch, and pine on the ship farthest from shore. Instances of even farther distribution of forest tree pollen are cited and discussed, with special reference to its influence on the question of sources of tree seed. It is pointed out that the fertilization of flowers with pollen from long distance may work against local, climatic conditions. The author is of the opinion that the presence of fossil pollen grains of certain trees in peat moors is not necessarily an index

to the previous flora of these moors, inasmuch as the pollen may have been carried from long distances.

**Anatomy of the union of a spruce graft on pine**, L.-G. Romell (*Meddel. Stat. Skogsförsöksanst., No. 16 (1919), pl. 2–3, pp. 61–66, figs. 2*).—The author describes a case of natural grafting of spruce on pine, and discusses anatomical peculiarities observed in the region of the union. A brief bibliographical paragraph of cited literature is appended.

From a study of the graft as a whole it is concluded the foreign cells, though to a large extent autonomously reacting in a morphological sense, react physiologically with each other in a thoroughly harmonious way as parts of a single organism.

**A study of the frustum form factors of hard maple and yellow birch**, B. A. Chandler (*Vermont Sta. Bul. 210 (1918), pp. 3–38, figs. 8*).—During the course of timber-estimating work on the State forests of Vermont and elsewhere from 1912 to 1917, the author found that volume tables based alone on diameter and height measurements gave thoroughly unsatisfactory results. Frustum form factors were computed from measurements of a few yellow birches and hard maples and applied to a table of frustum volumes, based on a local top diameter curve. In view of the more satisfactory results obtained by this preliminary application of the frustum form factor, the work was greatly extended in 1915 and 1916, measurements being made of over 1,200 trees, principally yellow birch and hard maple. Frustum form factors were constructed from these measurements and were studied chiefly to determine the laws which govern the frustum form and methods of expressing them. The results of the study are discussed in detail, and the application of the frustum form factor to practical timber estimating is described. A bibliography of cited literature is given.

Formulas were developed from the study to find the value of the absolute diameter breast-high frustum form factor in terms of the taper ratio and form quotient; the value of the absolute diameter breast-high cylinder form factor in terms of the frustum form factor and taper ratio; the value of the cylinder form factor, when the section below diameter breast high is computed as a cylinder, in terms of the absolute diameter breast-high frustum form factor and taper ratio; and the value of the absolute diameter breast-high cylinder form factor in terms of form quotient and taper ratio.

**The method of obtaining the form-class and volume of single trees by the use of form-point.—An investigation based on spruce material from Norrbotten, Sweden**, S. Petrini (*Meddel. Stat. Skogsförsöksanst., No. 15 (1918), pp. 233–273, XXIX–XXXII, figs. 9; Skogsvårdsför. Tidskr., No. 11–12 (1918), pp. 597–635, figs. 9*).—In the investigation here reported, measurements were made of spruce material from forests differing in age, height, density, quality of soil, etc., in order to determine the degree of accuracy of the form-point method in determining the volume of individual standing trees.

It is concluded that the form-point method can not be used with sufficient accuracy for single trees, because the form-class is determined only as an average value applicable to the whole material.

**Results of cutting at Ne-Ha-Sa-Ne Park, in the Adirondacks**, B. A. Chandler (*Jour. Forestry, 17 (1919), No. 4, pp. 378–385, figs. 3*).—Data are given of spruce growth and reproduction on lands cut over for spruce some 15 to 20 years ago.

The results of the study as a whole indicate that, on hardwood lands managed for spruce, as much of the hardwoods should be cut as market conditions will allow, and the maximum number of small and medium, well-topped, free

spruce consistent with lumbering conditions and danger from windfall should be left. It is concluded that possibly no satisfactory system of management for spruce can be found short of clear cutting and planting. In the area studied the spruce is being crowded out by the hardwoods which have taken advantage of the openings and are spreading out over the unused spaces every time that a conifer is removed.

**On the question of forest renewal,** H. BEEKMAN (*Boschbouwk. Tijdschr. Tectona, 12 (1919), No. 1–2, pp. 1–129*).—An exposition on forest regeneration in Netherlands Indies, with special reference to the reproduction of teak. An outline is given of investigations dealing with forest renewal conducted at the Forest Experiment Station, together with a bibliography of cited literature.

**The northeastern Minnesota forest fires of October 12, 1918,** H. W. RICHARDSON (*Geogr. Rev., 7 (1919), No. 4, pp. 220–232, figs. 5*).—A historical record of this disastrous fire, including a detailed map of the region burned over.

**A contribution on the tan bark question,** VAN DEN BUSSCHE (*Boschbouwk. Tidjschr. Tectona, 12 (1919), No. 3, pp. 217–251*).—A review of the present status of the tan bark industry in Java, including suggestions relative to its future development.

**Charcoal burning in Sweden,** M. A. F. DIJKMANS (*Cultura, 31 (1919), No. 368, pp. 115–145, pls. 5, figs. 19*).—A descriptive account of methods used in producing charcoal in Sweden.

## DISEASES OF PLANTS.

**Plant disease investigations** (*Kansas Sta. Rpt. 1918, pp. 36–38*).—The principal investigations in plant diseases carried on by the station were studies of wheat stem rust and corn smut and the resistance of sorghums to kernel smut.

More than 150 varieties of winter wheat were tested for their resistance to the stem rust (*Puccinia graminis tritici*), the experiments being undertaken both in the field and in the greenhouse. Three hard winter wheats were found remarkably resistant to the stem rust. Various selections have been made of these varieties, which are being propagated, as they appear to be of great commercial value. Hybrids between some of these forms and some spring wheats have been produced and the $F_1$ generation grown to maturity.

In connection with the rust investigations a biologic form was observed, an account of which has already been given (E. S. R., 39, p. 454).

In the smut investigations it was found that the smut organism is carried from the soil by the wind to the axils of the corn plant, from which cultures were readily obtained. A virulent culture in the topmost leaf axil was found to be a source for infecting the several nodes below. In an attempt to control the corn smut by the use of Bordeaux mixture and formaldehyde sprays, the treatments under Kansas conditions were found to be neither practical nor effective. While the percentage of corn smut was in some cases reduced, there was also a reduction in the yield. Some resistance to smut was reported in case of certain varieties.

A test was made of 38 varieties of sorghums to determine their resistance to kernel smut, and infection was found to vary from 0 per cent in case of milo, feterita, White durra, and Brown kaoliang to 38 per cent in the sorgo group. Attention is called to the fact that, while milo and feterita are usually classed as immune to smut, experiments have shown that infection can be secured by artificially injuring the seed and dusting them with smut spores.

**Report of the department of plant pathology,** M. T. COOK (*New Jersey Stas. Rpt. 1917, pp. 523–535, pls. 5*).—The author briefly refers to work that

has been in progress during the year. A list is given of the most common diseases that were observed during the year.

**The control of plant diseases due to fungi in Great Britain**, A. S. Horne (*Jour. Roy. Hort. Soc., 42 (1916), No. 1, pp. 13–26, pls. 4*).—This is a review of studies, requirements, and measures related to plant diseases in Great Britain and some other countries.

**Investigations [on plant diseases] at the National Fruit and Cider Institute** (*Jour. Bd. Agr. [London], 25 (1918), No. 3, pp. 316–320*).—This is a summary of portions of the work done during the year ended September 30, 1917, in connection with plant diseases and injuries. Portions of this work as reported by Barker and Bastin (E. S. R., 40, pp. 844, 847), have been noted.

**Phytopathological report, 1916 and 1917**, P. Marchal and G. Arnaud (*Min. Agr. [France], Ann. Serv. Épiphyties, 5 (1916–17), pp. 6, 7, 20–35*).—In this portion of the general report of the Phytopathological Station of Paris are noted the recent outbreak or extension of black canker of chestnut, American gooseberry mildew (*Sphærotheca mors uvæ*), and black rot of grapes. A somewhat systematic account is given also of injurious agents affecting plants of different classes, chiefly during the period under discussion.

**Summary reports of entomological and pathological laboratories** (*Min. Agr. [France], Ann. Serv. Épiphytics, 5 (1916–17), pp. 253–272*).—This report deals mainly with activities of the years 1916 and 1917 connected with injury by insects and fungi as reported from stations dealing with entomology or plant pathology or both, at Paris, Blois, Bordeaux, Montpellier, Saint-Genis-Laval, and Cadillac (Gironde). Lists of related contributions are also given.

**The disinfection of the soil**, E. Miège (*Min. Agr. [France], Ann. Serv. Épiphyties, 5 (1916–17), pp. 83–114, figs. 3*).—The present contribution (E. S. R., 28, p. 623; 36, p. 623) deals with soil treatments to increase fertility and to give control of plant diseases attacking by way of the soil.

**Gum formation with special reference to cankers and decays of woody plants**, B. B. Higgins (*Georgia Sta. Bul. 127 (1919), pp. 23–59, figs. 17*).—In a previous publication (E. S. R., 34, p. 747), the author suggested that gummosis was probably caused by the action of an enzym, and as an enzym is usually found in freshly formed gum the author carried on a series of experiments in the artificial production of gummosis under partially controlled conditions.

It was found that gum formation, although affected to some extent by variations in temperature, moisture, etc., is not dependent upon or always associated with growth activity. This behavior, together with the fact that a pectin-dissolving enzym is always found in freshly exuded gum, is held to indicate that gum formation is brought about by enzym activity.

**Studies on the crown rust of oats**, I. E. Melhus and L. W. Durrell (*Iowa Sta. Research Bul. 49 (1919), pp. 115–144, figs. 6*).—The data presented in this bulletin, obtained in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture, constitute a progress report dealing largely with the factors influencing the growth and reaction of crown rust (*Puccinia coronata*) of oats and different species of Rhamnus, the data having been accumulated during a period of three years. The temperature relations and the moisture requirements of the uredospores were investigated.

It was found that the minimum temperature for the germination of the uredospores of crown rust is 1° C., the optimum 17 to 22°, and the maximum 35° (95° F.). Direct contact with water is essential for the germination of the crown rust uredospores, a saturated atmosphere not furnishing sufficient moisture for germination. The environment under which the uredospores were produced is said to influence their germination to some degree, spores

borne on heavily infested seedlings not germinating so well as those produced on plants approaching maturity. A still, humid atmosphere favored the rapid maturity of the spores, and spores detached from the host plant and stored in dry capsules at 13 to 20° showed increasing germination after six or seven days.

The biologic form of crown rust occurring on oats uses *R. cathartica* and *R. lanceolata* as alternate hosts. *R. frangula*, *R. caroliniana*, and *R. alnifolia*, other species occurring within the State, were not found to harbor the alternate stage of the strain of crown rust occurring on oats.

Data concerning the dissemination of wheat rust, F. U. G. Agelius (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 115–117*).—It is believed that the persistence and succession of wheat rust (*Puccinia graminis*) without the æcidial stage in the neighborhood of Oswego, Kans., are due to the presence of many native (and mostly perennial) grasses, in some cases intimately associated with cultivated grains. The grasses retain their green color and are evidently infected with the fungus. *Panicum virgatum* appeared to harbor *Puccinia graminis*.

Report of celery investigation, R. F. Poole (*New Jersey Stas. Rpt. 1917, pp. 536–539*).—Field and greenhouse experiments have been carried on for the control of celery diseases, the principal of which were the crown rot due to *Bacterium* sp., damping-off or stem rot (*Sclerotinia libertiana*), root knot caused by nematodes, early blight (*Cercospora apii*), and late blight (*Septoria petroselini apii*). Damping-off due to *Rhizoctonia* sp. is reported to have given trouble in one greenhouse during the spring.

For the control of the crown rot due to *Bacterium* sp., a series of experiments in sterilization of the soil with various chemicals was carried out, and while the disease was not controlled the results indicate some promise for hydrochloric acid and calcium carbonate. The author believes that plant breeding offers the best solution of the problem of control of crown rot, as some varieties seem to possess considerable immunity.

For the control of the damping-off due to *Sclerotinia libertiana*, an experiment was carried out in which beds were divided into sections, one of which was thinned, the diseased plants being removed, and sodium nitrate added to the soil; the second was not thinned, but sodium nitrate was added to the soil; the third was thinned, the diseased plants being removed, but no sodium nitrate was added; and the fourth, which was given no treatment, was used as a check. Where the diseased plants were removed and the fertilizer added the best growth was made, very few plants dying. Where all diseased plants were removed and no fertilizer added only a few dead plants were observed. In the other plats many plants succumbed.

For the control of early blight and late blight, both of which did considerable damage, spraying with Bordeaux mixture is recommended.

The angular leaf spot of cotton, R. C. Faulwetter (*South Carolina Sta. Bul. 198 (1919), pp. 41, figs. 11*).—In continuation of previous studies on the physiology of *Bacterium malvacearum* (E. S. R., 36, p. 648) and rain as a factor in disease dissemination (E. S. R., 38, p. 47) the author brings together the data obtained by him in the course of his investigations, which have covered a period of several years.

The disease caused by *B. malvacearum*, while most noticeable on the foliage of cotton, may also be found on the cotyledons, stalks, petioles, bracts, and bolls. The factors most probably concerned in the hibernation and appearance of the disease are said to be the presence of bacteria in the soil, their survival in decaying cotton plants and plant parts, contamination of fuzz or short lint on the seed, internal seed infection, hibernation upon or in insects, and susceptibility

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of plants closely related to the cotton plant. Wind-blown rain is considered an important agent of dissemination, both local and general. Little evidence of insect dissemination has been found.

Sterilization of the seed coat by the use of sulphuric acid and bichlorid of mercury has been found the most efficient means of control.

**Attack of peas in Gironde by Heterodera schachtii**, J. CAPUS (*Min. Agr. [France], Ann. Serv. Épiphytics, 5 (1916–17), pp. 239–244*).—The author notes a severe outbreak of nematodes occurring in Gironde during 1915, but not since that time in sufficient severity to attract attention. The effects of the attack on the plants are described. The plants also showed the presence of a fungus, the characters of which are said to correspond closely to those of *Fusarium vasinfectum pisi*, considered as the conidial form of *Neocosmospora vasinfecta*. The fungus usually attacked the plants near the base of the stem, the nematodes attacking the roots, which showed the presence in large numbers of the brown cysts, which are simply the bodies of the females distended with eggs. The fungus is thought to be unable to attack vigorous plants.

**Common potato diseases and their control**, A. V. OSMUN (*Agr. of Mass., 1917, pt. 2, pp. 125–133, figs. 8*).—This is a discussion of early blight (*Macrosporium solani*), late blight (*Phytophthora infestans*), scurf or Rhizoctonia, scab, blackleg, and dry rot and wilt, with precautionary and other preventive measures, including sprays.

**Studies on potato leaf roll**, E. BLANCHARD and C. PERRET (*Min. Agr. [France], Ann. Serv. Épiphytics, 5 (1916–17), pp. 245–252, pl. 1*).—This is a more extended account than that previously noted (E. S. R., 40, p. 347) of potato leaf roll, which is said to exist in various degrees of severity in different areas indicated.

**Potato spraying experiments in 1917**, M. T. COOK (*New Jersey Stas. Rpt. 1917, pp. 561–563*).—A brief account is given of potato spraying experiments carried on in cooperation with some growers, in which Bordeaux mixture, Kil-Tone, and arsenate of lead were used as fungicides, some plats being sprayed with a combination of Bordeaux and arsenate of lead.

The highest yield in one instance was obtained where the plats received a spray of arsenate of lead, but the average of the plats receiving Bordeaux mixture and arsenate of lead was several bushels higher than that of the plats receiving no Bordeaux. On another farm the highest yield was obtained where Kil-Tone was used, the lowest yield being from the plat which had been sprayed with the combination of Bordeaux and arsenate of lead.

The author considers that not very much dependence can be placed in these results, as the crop was exceptionally free from disease in the early part of the season and the growth was unusually good.

**Smuts of jowar (sorghum) in the Bombay Presidency**. G. S KULKARNI (*Agr. Research Inst. Pusa Bul. 78 (1918), pp. 26, pls. 6*).—This report embodies the results of observations, which are still in progress, made by the author during 5 years in the Bombay Presidency on the smuts of jowar.

This name applies to all cultivated varieties of *Andropogon sorghum*, which occupies third place as regards acreage among cultivated crops of this region. The smuts, which are the most important among the fungus diseases of sorghums, are classed as loose, long, whole-head, and grain smuts, each of which is described. Experiments are cited to prove that infection with seed-borne spores occurs only in case of loose and grain smuts, and that copper sulphate checks the disease in both cases. Soil infection is apparently absent in case of these smuts, spores of which, however, may retain vitality from 2 to 6½ years under suitable conditions of dryness. Whole-head smut seems to attack chiefly by way of the soil and is not checked by seed treatment. Long

smut has not been adequately studied as to its life history, and its mode and habit of attack are not settled.

The nomenclature of these smuts is discussed in connection with descriptions of diseases and fungi.

The copper sulphate remedy is the only one considered applicable under local conditions, concentrations of from 0.5 to 3 per cent being considered as both safe and effective.

**On the mode of infection and prevention of the smut disease of sugar cane,** S. L. AJREKAR (*Agr. Jour. India, 11 (1916), No. 3, pp. 288–295, pl. 1*).—The author has carried out studies suggested by remarks made by Butler in a paper previously noted (E. S. R., 18, p. 450), attempting to ascertain how infection usually takes place in the field in case of sugar-cane smut and testing the efficacy of copper-sulphate treatment of sugar-cane sets before planting. These experiments were carried through 3 years in the neighborhood of Poona, where smut had appeared sporadically for some years, particularly on some thin varieties.

The results show that the disease may be carried by canes not obviously diseased if taken from stools some portions of which are affected. The fungus may be demonstrated in a side shoot not over 6 in. in length from an infected shoot; also in the tissues of the dormant buds in a diseased cane. Smut originating in diseased sets usually appears within 3 to 5 months after planting. Infection by spores adhering to sets does not usually become apparent until the crop is approaching maturity. No direct proof was obtained regarding probable infection of shoots by aerial transmission of spores and the formation of dormant mycelium in such shoots.

Steeping in copper-sulphate solutions is useless and does not check the disease. The practical control methods suggested are destruction of diseased canes and careful avoidance of infected stools for propagation purposes.

**Tomato spraying experiments at Riverton, N. J.,** W. H. MARTIN (*New Jersey Stas. Rpt. 1917, pp. 540–561, pl. 1*).—A report is given of spraying experiments for the control of the late blight of tomatoes carried on in 1917 in cooperation with the U. S. Department of Agriculture and a prominent tomato grower. The fungicides used consisted of Bordeaux mixture, the formula of manufacture of which was varied and to which in some cases resin fish-oil soap was added, a copper-sulphate mixture with the fish-oil soap, and a copper-sulphate soap mixture.

As a result of the investigation, it is claimed that late blight of tomatoes, caused by *Septoria lycopersici*, can be controlled by thorough spraying at the proper time. All of the fungicides used gave increased yields over the check plats and controlled the late blight. Standard Bordeaux mixture, while not giving the best control, gave the greatest increase in yield over the check plats. The copper-soap mixture gave good results, and, on account of its low cost and ease of preparation, it is thought that it should be given serious consideration. As a result of the season's work it is believed that spraying tomato plants in the seed bed in New Jersey is unnecessary but that the first application should be made not later than July 1. It was also ascertained that if all the leaves are held on the plants until frost a large part of the fruit formed will not ripen. In connection with these experiments different forms of spray machines were tested and while there was little difference in the two types compared, the traction sprayer, due to its low cost of upkeep, is considered the better.

The effect of late applications on the yield and ripening of tomatoes was investigated. From the results obtained, it is considered that the value of spraying late tomatoes is questionable.

**The apple tree anthracnose and how to control it**, L. CHILDS (*Better Fruit, 13 (1918), No. 5, pp. 7–9, figs. 3*).—This canker disease of the apple is said to be confined chiefly to sections west of the Cascade Mountains, and its development reaches its height in sections of abundant rainfall. Burgundy mixture, properly made up to 3:3:100, has given the best results as regards control.

**Brown rot of apples**, H. WORMALD (*Jour. Bd. Agr. [London], 25 (1918), No. 3, pp. 299–302, pls. 2*).—The progress of the causal fungus, *Monilia (Sclerotinia) fructigena*, after its inoculation into sound apples is here described. Discussion is given also of spur canker.

**Infection and immunity in apple rust**, N. J. GIDDINGS (*West Virginia Sta. Bul. 170 (1918), pp. 71, figs. 50*).—The author reviews the results of investigations undertaken for the purpose of securing definite and reliable information regarding the apple rust due to *Gymnosporangium juniperi virginianæ*, and the factors which result in the infection of the apple or cedar in some instances while in others there is apparent immunity. A previous account of some of the investigations included in this bulletin has already been noted (E. S. R., 35, p. 49).

Leaves of the variety York Imperial have been found usually susceptible to rust from 15 to 25 days after they unroll from the bud, the length of the period being closely associated with growth conditions. Infection data based on periods of rainfall, discharge of sporidia, etc., are considered to offer little definite proof that infection has taken place, since abundant sporidia discharge has been observed without any infection. Sporidia are not discharged in appreciable numbers at a temperature below 50° F. Under optimum conditions a fairly abundant discharge of sporidia may be observed in less than three hours after first moistening a mature sorus, slight evaporation apparently favoring the discharge.

The greatest injury to apple trees is said to be due to foliage infection. A severe rust infection may result in deformed fruit, general reduction in size of fruit, and great loss of vigor in the tree, and the results of severe infection may apparently persist for more than one season. A large percentage of fruit may show rust if the infection occurs about the time the blossoms fall.

The author has observed marked variation in susceptibility of red cedar trees to this disease.

On the apple, rust may be controlled by the use of sprays, but this method is not considered practical in commercial orchards. The destruction of cedar trees for a radius of two miles about susceptible orchards is recommended, and the cost of removing the cedar trees has not been found excessive under West Virginia conditions.

**Winter injury to cherry blossom buds**, R. H. ROBERTS (*Proc. Amer. Soc. Hort. Sci., 14 (1917), pp. 105–110, figs. 2*).—A study was made in the spring of 1917 of severe winter injury to cherry trees of several varieties occurring in Door County, Wis., near Sturgeon Bay; also of injury in the Bayfield district.

A large number of blossom buds was present. There was no die-back. Frequently only 1 or 2 of the 4 or 5 blossoms within a bud were killed. In 1917 the injury, while less severe than the previous year, followed the same relative lines as regards varieties. Exposure did not appear to have any influence as regards degree of injury. Trees partially defoliated by shot-hole fungus the previous year and young trees suffered less than other trees of the same variety, being also later in blossoming. In old Richmond trees, spurs of medium length suffered most injury; also along the terminal growth the injury to the lateral buds was more noticeable through the central part of the growth than at the base and the tip. The larger buds showed more injury. The last lateral

bud showed less injury than the lower buds. On young trees injury was less severe where less growth was made, so that immaturity does not appear to have favored frost injury. Bud killing does not appear to be due to second growth following high temperatures. A relation was noted between injury and size of buds or relative development, which is supposed to bear an important relation to the size of the leaf subtending the bud. These observations are regarded as preliminary.

**Brown rot on peaches**, M. A. BLAKE and C. H. CONNORS (*New Jersey Stas. Rpt. 1917, pp. 81, 82, pl. 1*).—The authors report the occurrence of brown rot of peaches in central and southern New Jersey, from 25 to 50 per cent of the blossoms being destroyed in some instances. In addition to the attack on the blossoms, the twigs were killed in numerous cases, the trees having the appearance of being affected by twig blight.

**Peach leaf curl and how to control it**, J. T. BREGGER (*Better Fruit, 13 (1918), No. 5, pp. 16, 17*).—The author states that Bordeaux mixture at winter strength (6:6:50) is satisfactory for control of peach leaf curl, and that lime-sulphur (1:8) will control leaf curl and San José scale when that pest is present.

**Peach yellows and little peach at Vineland**, M. A. BLAKE and C. H. CONNORS (*New Jersey Stas. Rpt. 1917, pp. 88–92, pl. 1*).—A report is given of the number of trees lost in some test orchards from 1909 to 1917. The authors state that no tree has yet become diseased that had been planted in the spot from which a diseased tree had been removed, and trees replanted in the earlier years are now bearing. The immediate removal of any tree as soon as the first symptoms of the disease appear is strongly advised.

**[Grape disease control and weather, 1917 and 1918]** L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 18, pp. 409–418, figs. 3; abs. in Rev. Sci. [Paris], 56 (1918), No. 15, p. 467*).—Noting principally observations made during the mildew outbreaks of 1917 and 1918, the author states that the almost perfect constancy of the time period between a given precipitation and the consequent appearance of infecting mildew spores (exactly seven days at Montpellier in 1917), permitting practically perfect control of this disease, is due to the well-established relations which obtain between atmospheric temperature and humidity. Brief notes are given on other subjects, as lime-sulphur mixtures and a sulphuric acid solution found effective against black rot.

**Outbreaks of grape downy mildew in the southwest of France in 1916**, J. CAPUS (*Min. Agr. [France], Ann. Serv. Épiphytics, 5 (1916–17), pp. 193–200*).—This account, which is in much more condensed form than that previously employed by the author (E. S. R., 36, p. 650), gives briefly data as to atmospheric conditions and other influences in connection with grape downy mildew and describes the 1916 outbreaks of this disease.

**Comparative value of acid and alkaline copper sprays for the treatment of grape downy mildew**, J. CAPUS (*Min. Agr. [France], Ann. Serv. Épiphytics, 5 (1916–17), pp. 201–209*).—This work, previously noted (E. S. R., 40, p. 158), showed that acid sprays are equally efficacious and immediate in effects as those of alkaline sprays under different atmospheric conditions. Bordeaux mixture having 2 per cent copper and 8 per cent lime was equal to standard Bordeaux in all respects. Conidia deposited on surfaces which had been sprayed but afterwards deprived by rainfall of copper deposits gave rise to zoospores. The basic sprays were more lasting in their effects than the acid sprays. The durability of acid or of alkaline sprays appears to be due not to the composition so much as to the degree of spreading or the degree of covering the surface, the deposit in case of alkaline sprays remaining practically continuous longer than in case of acid sprays.

**The characteristics of citrus canker and its eradication**, E. M. Doidge (*Union So. Africa, Dept. Agr. Bul. 3 (1918), pp. 9, pls. 10*).—The purpose of this bulletin is to familiarize growers and handlers of citrus fruits with the appearance of citrus canker, which is the most serious of citrus diseases.

So far as known, all outbreaks have originated in *Citrus trifoliata* stock from Japan. The disease is said to have been noted in the Philippines, Australia, South Africa, and the United States. A discussion is given of its characteristics, dissemination, and possible eradication. A list is given of places where citrus canker is found in South Africa, three of these occurring in the Cape Province and the others in five districts of the Transvaal.

**Sixteenth annual report of the [Massachusetts] State nursery inspector**, H. T. Fernald (*Agr. of Mass., 1917, pt. 1, pp. 61–73, pls. 2*).—An account is given of work done on white pine blister rust to December 12, 1917, by the State nursery inspector in cooperation with the U. S. Bureau of Plant Industry, including the planning, prosecution, difficulties, and results of that work.

The author considers it unwise at this time to attempt a State-wide control of the disease. It is thought that the best policy would be to select the best pine areas and remove all Ribes within 1 mile of such areas for at least a 5-year period.

**Disease of the Carolina poplar**, A. Bertin (*Vie Agr. et Rurale, 8 (1918), No. 17, p. 292; abs. in Rev. Sci. [Paris], 56 (1918), No. 14, p. 436*).—Mention is made of insect enemies of the Carolina poplar, the chief fungus disease of which is said to be caused by *Pleococcum populinum*. This usually attacks plants not over two or three years old and finds ready entrance at wounds. It is recommended that young trees be sprayed with 3 per cent Bordeaux mixture.

**A disease of Dalbergia latifolia**, H. Beekman (*Boschbouwk. Tijdschr. Tectona, 11 (1918), No. 4, pp. 290–293, pls. 2*).—A descriptive discussion is given of a canker affecting branches of *Dalbergia latifolia* noted in 1916 and earlier in several portions of the Dutch Indies, which are named. Suggestions are also given regarding the surgical and sanitary treatment which is recommended.

**Fungus diseases of rubber in Southern India**, W. MacRae (*Planters' Chron., 13 (1918), No. 23, pp. 395–401*).—In an address before the Rubber Planters' Conference at Cochin, the author dealt in a preliminary paper with the relations of Phytophthora to Hevea and cacao and with measures looking to control of the fungus, the complete classification of which appears to be not yet fully settled. Preventive measures are said to be still in the experimental stage, though results of tests appear to show that removal of fruit and dead branches will prevent the disease. The Phytophthora that attacks cacao was found able to cause a fruit rot of Hevea. See also previous notes (E. S. R., 40, p. 852).

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Wild animals of Glacier National Park** (*Washington: U. S. Dept. Int., 1918, pp. 210, pls. 37, figs. 94*).—Following a discussion of the general features governing life in Glacier National Park under the headings of physiography and life zones, by V. Bailey (pp. 15–24), the mammals are dealt with by V. Bailey (pp. 25–102) and the birds by F. M. Bailey (pp. 103–199). A colored map showing the life zones of the park, prepared by V. Bailey from a topographic base map of the U. S. Geological Survey, is attached.

**Mammals of Australia in the Zoological Park**, W. H. D. Le Souef (*Zoologica [N. Y.], 2 (1919), No. 6, pp. 163–201, pls. 30*).—A discussion of Australian mammals found in the New York Zoological Park.

Our national elk herds, H. S. GRAVES and E. W. NELSON (*In The Open, 9 (1919), Nos. 1, pp. 33–38; 2, pp. 26–34, pl. 1, figs. 2*).

[The mongoose in the West Indies] (*Bul. Dept. Agr. Trinidad and Tobago, 17 (1918), No. 4, pp. 167–192*).—A paper by C. B. Williams on The Food of the Mongoose in Trinidad (pp. 167–186), which records the stomach contents of 180 mongooses collected during the year October, 1917, to September, 1918, is followed by a paper on Rats and Mongoose in the West Indies (pp. 187–190) and the text of the mongoose ordinance, 1918 (pp. 190–192).

The muskrat in Bohemia, H. W. FRICKHINGER (*Naturw. Wchnschr., 33 (1918), Nos. 5, pp. 65–72; 6, pp. 73–81, figs. 26*).—A discussion of the occurrence and economic importance of the muskrat, control measures, etc. A bibliography of 43 titles is appended.

The birds of economic importance, A. GODARD (*Les Oiseaux Nécessaires a l'Agriculture, a la Sylviculture, a la Viticulture, a l'Arboriculture, et a l'Hygiène Publique. Paris: Perrin & Co., 1917, pp. II+121, figs. 18*).—A small handbook.

An early experiment in keeping hummingbirds in captivity, T. S. PALMER (*Condor, 19 (1917), No. 5, p. 168*).

Another reference to early experiments in keeping hummingbirds in captivity, T. S. PALMER (*Condor, 20 (1918), No. 3, pp. 123, 124*).

Notes on the insect fauna of bank swallows' nests in Virginia, T. E. SNYDER and R. C. SHANNON (*Proc. Ent. Soc. Wash., 21 (1919), No. 5, pp. 110–112*).

Class book of economic entomology, with special reference to the economic insects of the northern United States and Canada, W. LOCHHEAD (*Philadelphia: P. Blakiston's Son & Co., 1919, pp. XIV+436, figs. 265*).—This work consists of four parts, the first of which (pp. 1–69) deals with the structure, growth, and economics of insects; the second (pp. 71–92), with the identification of insects injurious to farm, garden, and orchard crops, etc.; the third (pp. 93–371), with the classification and description of common insects; and the fourth (pp. 373–413), with the control of injurious insects.

A method for the preservation of insect larvæ and pupæ, F. S. JACKSON (*Canad. Ent., 51 (1919), No. 5, pp. 117, 118*).—The author describes a method that may be used in the preservation of insects of all stages, including lepidopterous larvæ, by which both the form and color are preserved.

After the specimens are killed in the cyanid bottle or by means of chloroform vapor they are allowed to relax, and then placed in a fluid consisting of cane sugar 10 parts, glacial acetic acid 5 parts, formalin 2 parts, and distilled water 100 parts. The sugar is dissolved in the water and the acetic acid and formalin subsequently added. The specimens are allowed to remain in this fluid for about 24 hours, when they are transferred directly to a fluid identical in composition except that the acetic acid is omitted. After remaining in the second fluid for about 24 hours the fluid should be changed, and in case of large specimens a further renewal after the lapse of a week or ten days is advisable, since traces of acetic acid tend in some instances to destroy the color.

Plants used as insecticides, R. C. ROARK (*Amer. Jour. Pharm., 91 (1919), Nos. 1, pp. 25–37; 2, pp. 91–107*).—An annotated list which calls attention to promising insecticidal plants.

Fungoid and insect pests and their control.—I, Vegetable and pulse crops, F. O. MOSLEY (*Reading, [Eng.]: Author, 1918, pp. 26, figs. 52*).—Brief descriptions are given of several of the more important insect enemies of vegetable and pulse crops.

The insect pests of maize, W. B. GURNEY (*Agr. Gaz. N. S. Wales, 30 (1919), No. 3, pp. 196–202, pl. 1, figs. 4*).—In addition to the species dealt with in the

first part of this paper (E. S. R., 40, p. 453) the author gives information on the yellow Monolepta beetle (*Monolepta rosæ*), the yellow maize or peach moth (*Conogethes punctiferalis*), and the bollworm which attack Indian corn in New South Wales. Two additional species of cutworms now recorded as maize pests in New South Wales, namely, *Agrotis radians* and *Prodenia litura*, are also described.

**Forest zoology**, B. B. Osmaston (*Rpt. Forest Research Inst. [Dehra Dun], 1917–18, pp. 6, 7*).—The notes here presented relate to economic insects, particularly those attacking sal and teak.

**Entomology and the war**, L. O. Howard (*Sci. Mo., 8 (1919), No. 2, pp. 109–117*).—A brief discussion of some of the entomological problems dealt with during the war.

**Seventeenth report State entomologist of Minnesota**, A. G. Ruggles (*Rpt. State Ent. Minn., 17 (1918), pp. 240, pls. 3, figs. 231*).—Following brief notes on the insects of the year, by A. G. Ruggles (pp. 3–8), papers are presented on Life History of an Oak Twig Girdler (*Agrilus arcuatus torquatus*), by A. G. Ruggles (pp. 15–20); Potato Spraying in Minnesota, by S. A. Graham (pp. 21–31); The Carpenter Ant as a Destroyer of Sound Wood, by S. A. Graham (pp. 32–40); Drosophila in Bottled Certified Milk, by W. A. Riley (pp. 41–45); Contribution to Knowledge of the Tribes and Higher Groups of the Family Aphididæ, by O. W. Oestlund (pp. 46–72); The Confused Flour Beetle (*Tribolium confusum*), by R. N. Chapman (pp. 73–94); The Clover Seed Chalcid (*Bruchophagus funebris*), by W. Williamson (pp. 95–110); A Preliminary Report on the Trombidiidæ of Minnesota, by C. W. Howard (pp. 111–144); and The Hymenoptera of Minnesota, by F. L. Washburn (pp. 145–237).

**Third biennial report of the Montana State Board of Entomology**, R. A. Cooley (*Bien. Rpt. Mont. Bd. Ent., 3 (1917–18), pp. 60, pls. 5*).—This report deals particularly with the investigational and eradication work with the Rocky Mountain spotted fever tick (*Dermacentor venustus*).

The following papers are included: Report of Tick Control Operations in the Bitter Root Valley during the Season of 1918, Facts in Connection Therewith; Recommendations for the Further Prosecution of the Work, by R. R. Parker (pp. 25–40); Second Report on Investigations of the Rocky Mountain Spotted Fever Tick in Eastern Montana, by R. R. Parker (pp. 41–54); and Rocky Mountain Spotted Fever, Pathology and Etiology; Progress, by S. B. Wolbach (pp. 55–60).

In his second report, on biological studies of *D. venustus* (E. S. R., 37, p. 560), Parker deals at length with wild animals as hosts of immature ticks, presenting tabular data on the results of examination of wild animals for larvæ, nymphs, and adults, examination of domestic animals for adult ticks, etc.

**Sixteenth annual report of the State entomologist of Montana**, R. A. Cooley (*Montana Sta. Bul. 126 (1918), pp. 21–44, fig. 1*).—The author presents notes on the occurrence of the more important insect pests of the year, including grasshoppers; cutworms, which were particularly abundant; the Colorado potato beetle; *Hylemyia cerealis*, a maggot which occurred in stems of young winter wheat plants at widely separated points in the State; the sugar beet webworm (*Loxostege sticticalis*); the false chinch bug (*Nysius ericæ*); the alfalfa weevil (*Phytonomus posticus*); etc.

**Report of the department of entomology**, T. J. Headlee (*New Jersey Stas. Rpt. 1917, pp. 425–520, pl. 1, figs. 4*).—A list of the insects received and identified during the year, which includes the locality and date of receipt, is followed by a brief discussion of the occurrence of the more important forms and references to species introduced from abroad.

In investigations of the effect of climate upon the life and seasonal cycles of insects, in continuation of those of the previous year (E. S. R., 39, p. 771), work with the Angoumois grain moth and the bean weevil led to the following conclusions: "For at least two widely divergent species of the stored grain insect group, one a beetle and the other a moth, increase in atmospheric humidity means increase in speed of metabolism as measured by length of life cycle. The optimum percentage of atmospheric humidity is the highest which will not encourage a heavy growth of fungi. One hundred per cent atmospheric humidity destroys by encouraging the growth of fungi and low atmospheric moisture destroys directly, probably by the abstraction of water. While the egg stage of the bean weevil at least is most sensitive to the effect of low atmospheric humidity, other stages are unfavorably affected. Low atmospheric moisture might be developed into an efficient insecticide for certain species of stored grain insects."

The progress of work with the pear psylla, which was continued during the year in three orchards, is briefly reported upon.

A report of experiments on the adults and eggs of the peach tree borer, by A. Peterson (pp. 449–463), is summarized as follows: "The results in the above experiments are largely negative, so far as they may help to develop a much-needed control measure for the peach tree borer. In brief, they show the improbability of developing a poison bait for the adult, the partial repellent effect of certain chemicals on the female while ovipositing, and the partial destruction of eggs when certain substances are applied as a spray. A number of experiments have been started and are now in operation on the use of various chemical and mechanical tree protectors, but the evidence obtained thus far is insufficient to warrant a statement at this time. The author is of the opinion that the peach tree borer problem will be solved by a mechanical or chemical barrier which will kill the larva before it enters the tree or prevent it from getting into the tree. The development of any control measure along the line of killing the larva after it enters the tree is not advisable."

Investigations of the destruction of early seedlings of Lima beans along the Delaware Bay coast has shown it to be due to the seed corn maggot (*Pegomyia fusciceps*). An early spring brood emerges and lays eggs in the soil upon or in the vicinity of the bean seed and maggots which hatch out concentrate upon the bean seed and destroy it. Control appears to consist in the prevention of injury to the early planted seed, and experiments indicate that much is to be expected from the continuous wide band of tarred sand or strip of tarred paper.

The results of greenhouse fumigation work briefly outlined are to be issued as a bulletin.

A paper on soil-infesting insect investigations by A. Peterson (pp. 469–479) reports upon laboratory and field experiments with sodium cyanid and other chemicals against wireworms in the soil. The results show that while wireworms can be killed with large quantities of sodium cyanid the amount necessary to bring about a satisfactory control makes this method of soil treatment too expensive for ordinary use in the field.

House fly control investigations at Beach Haven are reported upon by A. Peterson (pp. 479–484).

A detailed report on mosquito work, including a map of New Jersey, showing the drainage and mosquito conditions in 1917 follows.

[Economic insects in South Dakota] (*Off. State Ent. S. Dak., 1918, Circs. 1, pp. 8; 2, pp. 2, fig. 1; 3, pp. 2, fig. 1; 4, pp. 2, fig. 1; 5, pp. 3, figs. 2; 6, pp. 2, fig. 1; 7, pp. 4, figs. 2; 8, pp. 7, figs. 3*).—These circulars relate, respectively, to the Nursery Inspection Law of South Dakota; and The Buffalo Tree-hopper, The

Plum Tree Borer [*Synanthedon pictipes*], The Leaf Crumpler, The Plum Web-spinning Sawfly [*Neurotoma inconspicua*], The Mealy and Rusty Brown Plum Lice [*Hyalopterus arundinis* and *Aphis setariæ*], The Plum Curculio and The Plum Gouger, and Scale Insects: The Oyster-shell Scale, Putnam's Scale, The Poplar and Willow Scale [*Chionaspius salicis-nigræ*], The San José Scale, and The Scurfy Scale, all by H. C. Severin.

**Miscellaneous insects,** H. A. Ballou (*Agr. News* [*Barbados*], *18 (1919), No. 440, p. 74*).—Brief notes are presented upon several insects of economic importance in the West Indies.

**[Papers on insects and insect control]** (*Min. Agr.* [*France*], *Ann. Serv. Épiphyties, 4 (1915), pp. 145–161, 218–336, pls. 2, figs. 26; 5 (1916–17), pp. 36–192, 210–244, figs. 24*).—These volumes contain the following papers relating to economic entomology:

Vol. 4.—Notes on the Biology of the Black Alfalfa Leaf Beetle (*Colaspidema atra*), the Elm Leaf Beetle (*Galeruella luteola*), and the Alder Beetle (*Agelastica alni*), by A. Lécaillon (pp. 145–161); Investigations on the Eudemis and Cochylis Moths in Bordeaux in 1914 (pp. 218–265) and in 1915 (pp. 266–276), by J. Feytaud; Notes on the Root Aphids, by J. Péneau (pp. 277–285); An Enemy of Cacao in New Hebrides (*Promecotheca opacicollis*), by J. Kowalski (pp. 286–328); Observations and Experiments on the Fungus Parasites of Insects, by A. Paillot (pp. 329–334); and Note on the Asparagus Beetle and Its Parasites [*Tetrastichus asparagi* and *Meigenia floralis*], by A. Paillot (pp. 335, 336).

Vol. 5.—Experimental Application of Arsenicals in the Control of the Codling Moth, by J. Feytaud (pp. 36–48); The Use of Arsenical Insecticides in Combating the Codling Moth on Apples and Pears, by A. Lécaillon (pp. 49–53); Application of the Arsenical Method to Fruit Culture in the Lyonnaise Region, by E. Massonnat (pp. 54–59); Use of Arsenicals Against Fruit Tree Insects, Particularly the Codling Moth, by J. Péneau (pp. 60–68); Experiments with Arsenical Insecticides, by E. Rabaté (pp. 69–73); Winter Fight Against the Vine Pyralid (*Œnophthira pilleriana*) by the Use of Arsenicals, by P. Marchal (pp. 74–82); The Disinfection of the Soil, by E. Miège (pp. 83–144); Study of the Vine Otiorhynchus (*Otiorhynchus sulcatus*), by J. Feytaud (pp. 145–192); Researches on the Bionomy of Birds of the Vineyard, by P. Paris (pp. 210–229); Notes on the Eudemis and Cochylis Moths in Bordeaux in 1916 and 1917, by J. Feytaud (pp. 230–238); and Invasions of Pea Culture in Gironde by *Heterodera schachti*, by J. Capus (pp. 239–244).

**Insect notes,** P. R. Dupont (*Ann. Rpt. Agr. and Crown Lands Seychelles, 1917, pp. 20, 21*).—A list is presented of 14 insects which attack the coconut in Seychelles, followed by notes on other insects of economic importance presented under the plants they attack.

**[Economic insects in Mysore]** (*Mysore Agr. Calendar, 1918, pp. 7–14, 27–34, 43–49, figs. 10*).—The papers here presented relate to the coffee borer, a serious pest found in more or less abundance in all localities and elevations in the coffee-growing areas in Mysore; sericulture in Mysore; and the fungus enemies of the green bug on coffee, of which the two most important are the white fungus (*Cephalosporium lecanii*) and the black fungus (*Empusa lecanii*).

**On a long-winged or caudate phase of Neotettix proavus,** H. Fox (*Ent. News, 29 (1918), No. 9, pp. 347–349, fig. 1*).

**Cacao thrips in Grenada** (*Agr. News* [*Barbados*], *13 (1919), No. 443, p. 122*).—A further report on the status of the cacao thrips in Grenada (E. S. R., 40, p. 856.)

**Burn the chinch bug,** W. P. Flint (*Univ. Ill., Col. Agr. Ext. Circ. 28 (1919), pp. 8, figs. 6*).—A map is given showing the chinch bug infested area of Illinois, which includes 26 counties, with directions for burning over to destroy the pest.

Fight the chinch bug with crops, W. L. BURLISON and W. P. FLINT (*Univ. Ill., Col. Agr. Ext. Circ. 30 (1919), pp. 14, figs. 7*).—A discussion of the crops which may be grown in combating the chinch bug.

The oriental fruit moth in Virginia, L. A. STEARNS (*Quart. Bul. Va. State Crop Pest Com., 1 (1919), No. 1, pp. 3–7, figs. 5*).—A thorough inspection of Alexandria and Fairfax Counties indicates that *Laspeyresia molesta* has become generally established in home orchards south and west of the Potomac River to a line drawn through the points Great Falls, Herndon, Fairfax, Annandale, and Alexandria. A similar inspection of Loudoun County located an "outpost" of infestation in a single commercial orchard at Leesburg. Both twigs and fruits showing suspicious typical injury have been collected in orchards along the railway from Leesburg to Bluemont.

The European corn borer (Pyrausta nubilalis), E. P. FELT (*N. Y. State Col. Agr., Cornell Ext. Bul. 31 (1919), pp. 35–42, pls. 2, figs. 5*).—A popular summary of information on this pest which has appeared in New York State in the vicinity of Scotia. The infestation covers about 400 square miles, extending west to Fort Hunter and east of Schenectady.

The sugar cane moth borer, T. E. HOLLOWAY and U. C. LOFTIN (*U. S. Dept. Agr. Bul. 746 (1919), pp. 74, pls. 10, figs. 12*).—This is a report of the present status of knowledge of *Diatræa saccharalis crambidoides*, based upon a review of the literature and investigations conducted by the authors over a period of years, together with technical descriptions of the larva and pupa stages by C. Heinrich.

It is shown that this form occurs in Florida as far north as Gainesville, in southwestern Mississippi, in southern Louisiana, and in the Rio Grande Valley in Texas in the vicinity of Brownsville.

Its only parasite of importance in the United States is *Trichogramma minuta*, which attacks the egg and is universally distributed in the sugar-cane fields of Louisiana and also in the Rio Grande Valley in Texas. Mention is made of a number of natural enemies which occur in foreign countries, including a Cuban tachinid (*Euzenilliopsis diatrææ*), introductions of which are being made into Louisiana. Experiments and observations on artificial control, which are presented in detail, have led to the following recommendations:

"Scraps of cane left about the factories and derricks, after the grinding season, should be destroyed by burning or otherwise. Cars in which cane is shipped, especially if they go into noninfested territory, should be kept free of such scraps. Seed cane should be planted in the fall, if possible, and kept as deeply covered as practicable. Extraordinarily deep planting is not advocated, but as borer moths fail to emerge from cane under more than 0.5 in. of compact soil, care should be taken to keep the seed cane well covered to that depth as a minimum. A heavy rain will sometimes wash the earth from the seed cane from one end of the row to the other, and in this case it is important to cover the cane again as soon as possible, especially in the spring, when the moths are emerging.

"Cane for shipment to points beyond the infested area should be selected so as to obtain it sound and free of borers, or, if this is impossible, it should be soaked, previous to shipment, for at least an hour in Bordeaux mixture or a solution of nicotin sulphate.

"The 'trash,' leaves, or 'shucks' left on the fields after cutting should not be burned, but should be lightly covered with earth in the fall and plowed out in the spring. This practice has never been found to increase the borer infestation, and it has often diminished it. The soil is fertilized by the buried

trash and its mechanical condition is greatly improved. Cutting out 'dead hearts' or dead plants and destroying them is theoretically sound, and with an abundance of cheap labor it might be recommended.

"The introduction of parasites of the moth borer from Cuba and other tropical countries is recommended."

A bibliography of 185 titles is appended.

**Peach borer observations at Vineland**, M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1917, pp. 83–88, fig. 1*).—The borers removed from each tree in three orchards, in continuation of records of previous years (E. S. R., 39, p. 765), are recorded in tabular form, charted, and discussed.

The infestation by borers during the year was apparently more general and more evenly distributed. It was observed in one of the orchards that three rows, which had been set in holes made with dynamite, had the lowest percentage of trees infested and the smallest number of borers found in 1917. As a possible explanation, it is pointed out that the trees planted by the use of dynamite made a much more rapid average growth during the first few years, and it is possible that they presented a more unbroken surface of bark, which, in the author's experience, tends to make them resistant to borer attack.

**Argyresthia illuminatella**, K. T. Schütze (*Deut. Ent. Ztschr. "Iris," 31 (1917), No. 1–2, pp. 4–23; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 11, p. 479*).—The caterpillar of *A. illuminatella* infests the ends of the twigs of *Abies alba* and lives exclusively on this tree, the attacked branches being recognized in the autumn by the slightly yellowish-green color of the needles. The eggs are laid on the buds at the tip of the twigs, the buds are eaten, and the whole twig is completely hollowed out. Pupation takes place in these hollowed twigs.

**The apple bud moths and their control in Nova Scotia**, G. E. Sanders and A. G. Dustan (*Canada Dept. Agr., Ent. Branch Bul. 16 (1919), pp. 39, figs. 14*).—This reports investigations of bud moths, the most important insects generally affecting orchards in Nova Scotia, which have been conducted since 1912. While the recommendations as to control measures are based upon local conditions, the general features of the life history and habits are applicable to the insect in other Provinces.

The four most common and injurious species of bud moths in Nova Scotia are the eye-spotted bud moth, the oblique banded leaf roller (*Cacœcia rosaceana*), the lesser bud moth (*Recurvaria nanella*), and the green bud worm (*Argyroploce consanguinana*). In general, their life histories and the injuries inflicted are similar in all four species. All are small winged moths which fly during June and July and deposit their eggs on the leaves of the apple. "Three of the four species injure the apple in the fall by occasionally attaching the leaf on which they are feeding to the fruit, and under the attached leaf eating through the skin of the apple, marring the surface, and injuring the appearance and keeping qualities.

"All species pass the winter as partly grown larvæ under bits of bark or in crevices about the fruit spurs. In the spring the larvæ merge from their hibernating quarters as the buds swell and eat into the opening buds, where they feed on the expanding flowers, thus affecting the set of the fruit. It is estimated that the bud moths reduce the crop in unsprayed or poorly sprayed apple orchards in Nova Scotia about 30 per cent. About 75 per cent of the bud moths can be destroyed and the crops increased about 22.5 per cent by two thorough applications of poisoned spray applied before the blossoms open, with a nozzle throwing a coarse, driving spray."

Technical descriptions are given of the several stages of these species, together with notes on their life history and habits in Nova Scotia and a report of control work.

Cutworms, R. W. JACK (*Rhodesia Agr. Jour., 15 (1918), Nos. 3, pp. 225–237, pls. 3, fig. 1; 4, pp. 344–348*).—Four species of cutworms are recorded from Rhodesia, namely, *Euxoa segetis*, *E. longidentifera*, *E. spinifera*, and the black cutworm, of which *E. segetis* and the black cutworm are of real importance. In a search for an effective remedy for *E. segetis*, the species occurring most commonly in Rhodesia, 124 experiments were carried out at Salisbury.

"While the results obtained with arsenite of soda against *E. segetis* are unsatisfactory, the use of Paris green on green foliage was almost uniformly successful against all species tested. [The black cutworm] and *E. longidentifera* yield more readily to arsenite of soda than *E. segetis*. An even more striking disparity of tastes is shown in connection with the use of bran in making the bait, this carrier failing in every instance against *E. segetis* while the other two species apparently eat it readily."

**A map showing the known distribution in England and Wales of the anopheline mosquitoes, with explanatory text and notes**, W. D. LANG (*London: Brit. Mus. (Nat. Hist.), 1918, pp. 63, pl. 1; rev. in Nature [London], 101 (1918), No. 2546, p. 463*).—This map shows the known distribution in England and Wales of three species of anopheline mosquitoes, namely, *Anopheles maculipennis*, *A. bifurcatus*, and *A. plumbeus*, the first two of which are known to be carriers of malaria. In the accompanying text the localities are arranged alphabetically under each of the three species, primarily according to the counties and secondarily according to the place names. A brief résumé of what is known of the life history of each species is also included.

**Notes on the Nearctic Nusa (Diptera, Asilidæ)**, W. L. MCATEE (*Ohio Jour. Sci., 19 (1919), No. 4, pp. 244–248, figs. 5*).

**Leiomyza in North America**, J. M. ALDRICH (*Ent. News, 30 (1919), No. 5, pp. 137–141, fig. 1*).

**Note on leskiine synonymy**, C. H. T. TOWNSEND (*Proc. Ent. Soc. Wash., 21 (1919), No. 1, p. 20*).

**Coleoptera illustrata**, H. NOTMAN (*Brooklyn, N. Y.: Author [1915–1917], vol. 1, pts. 1–4, pp. [14], pls. 200*).—This volume contains 200 illustrations of species of Carabidæ.

**Chrysobothris tranquebarica Gmel. versus impressa Fabr. (Coleoptera; Buprestidæ)**, W. S. FISHER (*Proc. Ent. Soc. Wash., 20 (1918), No. 3, pp. 173–177*).—*C. tranquebarica* is of considerable economic importance, due to its attacks upon the so-called Australian pine (*Casuarina equisetifolia*), which has been planted quite extensively for ornamental and shade purposes in some parts of Florida.

**The convergent ladybird beetle (Hippodamia convergens) and the barley corn aphis (Aphis maidis)**, W. M. DAVIDSON (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 1, pp. 23–26, figs. 2*).—This is a report of progress of a project relating to the natural control of *A. maidis* by the convergent ladybird beetle, started in the Imperial Valley of California in the spring of 1918.

**Mobilizing a ladybug army to fight the aphis**, H. E. THOMAS (*Sci. Amer., 120 (1919), No. 20, pp. 507, 522, 524, figs. 3*).—Attention is called to the fact that 100,000,000 ladybird beetles will be distributed in the State of Washington in the spring of 1919, more than 25,000,000 having been stored ready for release. The work is being carried on by the county agricultural agents in cooperation with the Forest Service of the U. S. Department of Agriculture, the forest ranger of which service has exceptional opportunities to find the caches of the

ladybird beetles, and with the Bureau of Entomology of the same Department through its station at Forest Grove, Oreg.

**Five new species of ptinid beetles**, W. S. Fisher (*Proc. U. S. Nat. Mus., 55 (1919), pp. 295–299*).—The species here considered are *Ptinus huesanus* n. sp., collected on *Ichthyomethia piscipula* at Key West, Fla.; *Oligomerus arbuti* n. sp., on dead manzanita (*Arbutus* sp.) at Placerville, Cal.; *Ernobius conicola* n. sp., reared from cones of *Cupressus macrocarpa* and from larvæ feeding on scales and tissues of green and dry cones of *C. macrocarpa* at Pacific Grove and Point Lobos, Cal.; *E. californicus* n. sp., reared from bark and outer wood of branches of recently killed *Pinus jeffreyi* in Ventura County, Cal.; and *E. champlaini* n. sp., collected on dead limbs of *P. flexilis* in Waldo Canyon, Colo.

**The apiary in Quebec**, C. Vaillancourt (*Min. Agr. Prov. Quebec Bul. 61 (1919), pp. 78, figs. 48*).—A popular account.

**Elements of beekeeping**, H. R. Niswonger (*Univ. Ky., Col. Agr. Ext. Div. Circ. 69 (1919), pp. 22, figs. 8*).—A popular account.

**Unheated egg-yolk media**, G. F. White (*Science, n. ser., 49 (1919), No. 1267, p. 362.*)—The author has for several years made use of unheated egg-yolk media and found them specially valuable in studying *Bacillus larvæ*, which offers considerable difficulty in its cultivation. The technique employed in its preparation is described.

**The carpenter ant as a destroyer of sound wood**, S. A. Graham (*Rpt. State Ent. Minn., 17 (1918), pp. 32–40, figs. 8*).—"Large black ants commonly known as carpenter ants [*Componotus pennsylvanicus*] are doing considerable damage to standing white cedar in Minnesota, at least 20 per cent of the trees cut showing ant injury on the stump. The colonies are started in a wound, knot hole, or decayed spot, usually near the butt of the tree. The ants hollow out a nest in the heart of the tree, sometimes leaving only a thin shell of wood around it, thus seriously weakening the tree at that point. From this nest the ants cut openings to the outside, called windows, and to locate a nest it is only necessary to look for the windows.

"Much unavoidable loss is occasioned by ant injury, but there is also an immense amount of loss through careless cutting of poles. Culling heavily for ant injury has meant leaving in the woods anything that looks suspiciously like a cull. The grading rules regarding ant injury should be made more lenient so as to encourage more careful trimming of ant-infested poles."

**Three new species of Braconidæ**, C. F. W. Muesebeck (*Canad. Ent., 51 (1919), No. 5, pp. 113–116*).—Among the species here described as new is *Apanteles phigaliæ*, which parasitizes *Phigalia titea* at Melrose Highlands, Mass.

**New reared parasitic Hymenoptera, with some notes on synonymy**, A. B. Gahan (*Proc. U. S. Nat. Mus., 55 (1919) pp. 113–128, figs. 2*).—This paper contains descriptions of 2 genera and 12 species of Ichneumonoidea and Chalcidoidea, including *Phaeogenes (Centeterus) ineptifrons* n. sp., reared from the oriental peach moth (*Laspeyresia molesta*) at Washington, D. C.; *Dacnusa iridicola* n. sp., reared from *Agromyza laterella* at Middleburg, Pa.; *Trioxys cupressicola* n. sp., from *Cerosipha* n. sp., at Riverside, Cal.; *Chelonus (Chelonella) proteus* n. sp., and *Apanteles stagmatophoræ* n. sp., both from *Stagmatophora gleditschiæella* at Williamsport, Md.; *Bassus immaculatus* n. sp., reared in connection with and possibly parasitic on *Phthorimæa striatella* at Baton Rouge, La.; *B. usitatus* n. sp., reared in cages with the cranberry fruit worm and probably parasitic on it at East Wareham, Mass.; *Orgilus dioryctriæ* n. sp., from *Dioryctria xanthaenobares* on *Pinus attenuata*, Patricks Creek, Cal.; *Pseuderimerus mayetiolæ* n. g. and n. sp., from the Hessian fly at Altamont, Cal.;

*Heteroschema prima* n. g. and n. sp. and *Habrocytus simillimus* n. sp., both from *Agromyza gibsoni* at Tempe, Ariz.; and *Eutelus mayetiolæ* n. sp., from the Hessian fly at Salinas, Cal.

**The rice worm (Tylenchus angustus) and its control.** E. J. BUTLER (*Mem. Dept. Agr. India, Bot. Ser., 10 (1919), No. 1, pp. 37, pls. 2, figs. 3*).—This reports further studies (E. S. R., 30, p. 540) of the life history and habits of *T. angustus*, a nematode which causes the "ufra" disease of rice in the great rice-growing deltic tract at the head of the Bay of Bengal, means for its control, etc.

**Some significant structural modifications in Nearctic termites.** T. E. SNYDER (*Proc. Ent. Soc. Wash., 21 (1919), No. 5, pp. 97–104, pl. 1*).

## FOODS—HUMAN NUTRITION.

**Experiments on the digestibility of wheat bran in a diet without wheat flour.** A. D. HOLMES (*U. S. Dept. Agr. Bul. 751 (1919), pp. 18*).—In connection with studies of grains for food purposes, supplementing earlier work (E. S. R., 17, p. 481), the digestibility of coarse (unground) and finely ground wheat bran was determined, with healthy young men as subjects. The bran was fed in each case in the form of a simple bread and the remainder of the diet consisted of potatoes, fruit, butter, and sugar—that is, foods which supplied little besides fat and carbohydrate.

The results indicate that of the protein supplied by the fine bran 44.7 per cent and of the bran carbohydrate 56.6 per cent was digested, while the results of the tests with coarse bran indicate a digestibility of 28 per cent for the bran protein and 55.5 per cent for the bran carbohydrate.

The coefficients of digestibility of the diet as a whole (37 per cent for protein, 88.5 per cent for fat, and 79.8 per cent for carbohydrate, in the series in which fine bran was eaten, and 35.8 per cent for protein, 93.1 per cent for fat, and 82.8 per cent for carbohydrate, in the series in which coarse bran was eaten) are lower than those found in other experiments of the Department with a mixed diet. "This indicates the way in which the rough, relatively indigestible bran influenced the digestibility of the entire diet. It is also possible that the bran stimulated peristaltic action to such an extent that the food materials were not as completely absorbed as is normally the case when they pass through the alimentary tract without increased peristalsis.

"In general the amount of feces voided by the subjects during the tests with bran was larger than normal. This condition was noted by all the subjects, regardless as to whether they were of active, athletic, or sedentary habits. Some of the subjects found the bran diets decidedly laxative. Little, if any, difference was noted by the subjects as a whole between the laxative effects of the fine and coarse brans."

**Milling grain sorghums** (*Kansas Sta. Rpt. 1918, pp. 34, 35*).—In continuation of the milling and baking tests with Kafir corn previously noted (E. S. R., 40, p. 361), it was found that a rather fine meal could be prepared which made a quite satisfactory substitute for corn meal, although somewhat darker in color and having a characteristic slightly bitter taste. A product corresponding to whole-wheat flour was made by grinding a blend of 35 per cent of Kafir corn and 65 per cent of wheat. It is said that less shortening should be used with Kafir-corn mixtures than with pure wheat.

**How to prepare banana meal** (*So. African Jour. Indus., 1 (1918), No. 15, pp. 1381, 1382*).—A method for the preparation of banana meal described by J. de Verteuil, in the *Port of Spain Gazette*, of February 7, 1918, is given.

"Peel and slice the bananas thinly with a nickel or fruit knife. Spread on wooden trays in the sun to dry. When dry crush in an ordinary mill or pound

in a mortar and sift through fine muslin. The meal may be used in bread and cakes by mixing with an equal portion of wheaten flour, or it may be cooked and eaten as oatmeal porridge or rice pudding.

"Dasheen, sweet potato, tannia, and yam meals can all be made in the same way as advised for banana meal, i. e., peeling, washing, slicing, and milling the drier chips. Excellent bread, etc., can also be made from equal parts of wheaten flour and any of the above meals."

**The utilization of yeast in the animal organism**, E. Schill (*Biochem. Ztschr., 87 (1918), No. 3–4, pp. 163–175*).—Feeding experiments with laboratory animals (dogs) in which the food value of yeast was studied indicate, in the author's opinion, that the protein of yeast is well utilized.

**Digestibility of certain miscellaneous animal fats**, A. D. Holmes (*U. S. Dept. Agr. Bul. 613 (1919), pp. 25*).—Continuing earlier work (E. S. R., 36, p. 860) the digestibility of 9 animal fats was studied, with young men as subjects.

The coefficients of digestibility were found to be 98.4 per cent for goat's butter, 95.3 for kid fat, 93.7 for hard-palate fat, 93.9 for horse fat, 96.8 for oleo oil, 80.1 for oleo stearin, 93.5 for ox-marrow fat, 96.6 for ox-tail fat, and 98.6 per cent for turtle fat.

"In the reports of their physical condition during the test periods, the subjects did not note any physiological disturbances except in the case of ox-marrow fat, which seemed to have a slightly laxative effect. No evidence was secured as to whether this condition resulted from the nature of the fat or from the fairly large amount [74.5 gm.] ingested daily."

On the basis of the experiments reported, it is concluded that these fats, when eaten in amounts equivalent to the amount of butter eaten in the normal dietary, are well assimilated, and that judged by this and what is known of their use as food fats they should prove wholesome sources of fat for human consumption.

**Whale meat as food**, V. Stubbins (*Food and Cookery and Catering World [London], 23 (1919), No. 247, pp. 16, 17*).—It is calculated that many of the whales caught average about 50 tons in weight and that after the removal of the bone and blubber between 5 and 6 tons of flesh available for human food remains. This flesh is said to be very tender, agreeable in taste, and richer than beef in protein by 2 per cent.

**Whale meat in the diet** (*Jour. Agr. and Hort. [Canada], 22, 1919, No. 9, p. 159*).—Some data on the extent of shipping whale meat as food from the Canadian Pacific coast are given. "Whales taken on the Pacific coast yield from 3 to 12 tons each of prime meat, and this only is used for canning and freezing. . . . Analysis of the flesh shows it somewhat to resemble corned beef or mutton. It contains 34 per cent of protein, the principal tissue-forming material of food, as compared with from 13 to 14 per cent in mutton or pork. Sales of whale meat are not yet large in Canada or the United States, but a good deal has been shipped to Samoa and Fiji."

**Food values and dairy products**, O. R. Overman (*Illinois Sta. Circ. 235 (1919), pp. 3–28, fig. 1*).—The author summarizes a large amount of data in this comparison of dairy products (milk, skim milk, cottage cheese, and American cheddar cheese) with other foods. His conclusion is that these are to be regarded as among the cheapest foods of animal origin, both as to protein and total energy.

"Milk containing 4 per cent of fat is a more economical source of both protein and energy than are meats, eggs, poultry, or fresh fish. . . . Skim milk at 15 cts. a gallon is far cheaper as a source of protein and energy than are

other foods of animal origin. It is, at this price, cheaper as a source of protein than are dry beans and peas at 15 cts. a pound. On the basis of energy the cost of skim milk and dry beans and peas is nearly the same. Cottage cheese is a much more economical source of protein than are other animal foods. It is an excellent meat substitute. On the basis of energy cottage cheese and meats cost nearly the same. It is cheaper than fresh fish, and at 15 cts. a pound is cheaper than eggs at 30 cts. a dozen. American cheddar cheese costs very much less than meat, poultry, eggs, or fish sufficient to furnish an equal amount of protein or of total energy and is an excellent substitute for these foods."

**[Miscellaneous food topics]**, E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 5 (1919), No. 9, pp. 191, 192, 208–218*).—The authors note that when butter contains over 16 per cent of water it is liable to taxation, and give information regarding adulterated and misbranded butter. It is stated that a tendency has been observed in some places to sell butter short weight and adulterated by the addition of excessive amounts of water.

An article on so-called egg substitutes by La Wall (E. S. R., 40, p. 558) is reprinted.

**The Chinese petsai as a salad vegetable**, D. FAIRCHILD (*Jour. Heredity, 9 (1918), No. 7, pp. 291–295, figs. 2*).—The author believes that the Chinese petsai, a leaf vegetable of pleasant taste, might well be used to supplement lettuce.

**Food sauces of Europeans and Indo-Chinese compared**, ROSÉ (*Bul. Écon. Indochine, n. ser., 21 (1918), No. 131, pp. 525–532*).—Analyses of nuoc-mam (a product similar to soy sauce) and other sauces are reported. The uses and value of such products are discussed.

**[Food inspection]**, A. M. G. SOULE (*Agr. of Maine, 1917, pp. 78–89*).—A report of the chief of the bureau of inspection on the enforcement of the pure food law in Maine for the year 1917.

**[Food inspection]** (*Brit. Food Jour., 20 (1918), No. 241, pp. 127–136*).—An abstract from the annual report of the Principal of the Customs and Excise Laboratory on the work of the laboratory for the year ended March 31, 1918.

**Report of the fifteenth convention of the Association of German Food Chemists** (*Ztschr. Untersuch, Nahr. u. Genussmtl., 35 (1918), No. 1–3, pp. 152*).—This report includes, among other addresses and discussions, the following: Food Substitutes and Their Regulation, by A. Beythien; Food Substitutes and Their Valuation, by S. Rothenfusser; Beer Substitutes, by K. Windisch; Coffee Substitutes, by M. Klassert; Fruit Juices and Their Substitution, and Marmalades and Artificial Marmalades, by P. Buttenberg; The Use of Mineral Matter in Baking Powder, by L. Grünhut; Baking Powder, by F. Wirthle; Soup and Broth Cubes, by C. Mai; Calculation of Food Value of Foods, by E. Seel; and Ascertaining the Food Value of Mushrooms, by M. Klostermann.

**Ten lessons in thrift** (*Washington: War Loan Organ., U. S. Treas. Dept., 1919, pp. 16*).—This outline includes thrift in the household, the household budget, family accounting, and similar topics.

**Cold storage reports, season 1917–1918.—Apples, butter, American cheese, eggs, and poultry**, J. O. BELL (*U. S. Dept. Agr. Bul. 776 (1919), pp. 44, figs. 19*).—This publication, designed particularly for trade uses, reports statistical data containing earlier work (E. S. R., 40, p. 68).

**Food surveys** (*U. S. Dept. Agr., Food Surveys, 2 (1919), Nos. 25, 26, pp. 8 each*).—Data are reported as to commercial stocks of grain, flour, and miscellaneous food products in the United States on April 1 and May 1, 1919, respectively.

**Europe's larder.—Record American exports** (*Nat. Food Jour. [London], 2 (1919), No. 34, p. 266*).—A tentative record of the quantity and value of the food exported from the United States to England during the year 1918.

**Food supply manual revised to July 31, 1918** (*London: Govt., 1918, pp. 701*).—This comprises a classified and indexed compilation of the British food controller's powers and orders, and also orders of other departments ancillary thereto.

**Food regulations** (*Pub. R. Accad. Lincei, Comitato Sci. Aliment. [Rome], Nos. 3 (1918), pp. 6; 4, pp. 3; 6, pp. 12; No. 8 (1919), pp. 18*).—No. 3 of these papers deals with statistics on the food consumption of Italy; No. 4 with the standards regarding the meat consumption of the civil population; No. 6 with the regulations pertaining to the slaughter of young animals; and No. 8 gives a summary of the work of the committee in charge.

**The food supply of our allies**, G. Lusk (*Amer. Mus. Jour., 18 (1918), No. 8, pp. 629–635*).—This article explains how the estimates of the amounts of imported meats, fats, sugar, and cereals needed during 1919 by Great Britain, France, and Italy were obtained.

**Food situation in Austria during the summer of 1918** (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 7 (1918), No. 6, pp. 168–196*).—This article has been compiled from various Austrian daily papers in the form of translations and digests.

**Diet, nutrition, and excretion of the Asiatic races in Singapore, I–II**, J. A. Campbell (*Reprinted from Jour. Straits Branch Roy. Asiatic Soc., 1917, Nos. 76, pp. 57–65; 79, pp. 107–112*).—This study, which is in two parts, was undertaken in order to supply the local medical students with necessary information.

In part 1, the diets of one Chinese, one Brahmin, and one Tamil, all medical students, were under observation for 6 months, while one Malay was studied for 2 weeks. The weights of the subjects was 92 lbs. for the Chinese, 110 for the Brahmin, 125 for the Malay, and 143 for the Tamil.

The average values of the diets were for the Chinese 1,577, Tamil 1,672, Malay 1,502, and Brahmin 2,493 calories. The protein intake per day was for the Chinese 60, Tamil 58, Malay 57, and Brahmin 83 gm. [Computed on the basis of 150 lbs. body weight the energy values become—Chinese 2,571, Brahmin 3,399, Malay, 1,802, and Tamil 1,754 calories, and for protein intake, Chinese 98, Brahmin 113, Malay 68, and Tamil 61 gm.]

The author draws the following conclusions:

"The results obtained from examination of the kidney excretion of local students indicate that the European figures are of no value when dealing with Asiatic patients. The total nitrogen varies from 6.64 gm. in the Brahmin to 9.25 in the Chinese. The urea varies from 11.08 gm. in the Brahmin to 16 in the Chinese. The ammonia varies from 0.57 gm. in the Brahmin to 0.66 in the Malay. The ammonia coefficient varies from 5.4 per cent in the Chinese to 7.1 in the Brahmin. The chlorids vary from 5.2 in the Tamil to 8 in the Malay." Corresponding values for an European in Singapore were found to be for total nitrogen 15.3 gm., urea 25, ammonia 1.06, and chlorids 8.1 gm., and ammonia coefficient 5.6.

"The Singapore student partakes of a smaller amount of food than the Philippine or Bengali student. This seems to be due directly or indirectly to the climatic conditions of Singapore."

Part 2 takes up similar studies made with 2 Chinese bakers, 2 Tamil gardeners, a Malay gardener, a Chinese rickshaw runner, 5 Chinese rubber-estate coolies, and 6 Chinese prisoners. It is concluded that the kidney excretions for these laborers differ considerably from the standard amounts given for Europeans in Europe. The total nitrogen varied from 7.2 to 11.4 gm., the urea from 13.4 to 21 gm., the uric acid from 0.43 to 0.65 gm., the ammonia from 0.61 to 1.09 gm., the chlorids from 2 to 7 gm., and the phosphates from 1.25 to 1.8 gm.

"The local laborer uses less protein and fat but more carbohydrate than the European. The metabolized food of the former has a smaller calorific value."

**Dietaries suitable for secondary schools, colleges, hostels, clubs, etc.**, D. C. MOORE and C. E. HECHT (*London: Nat. Food Reform Assoc., 1919, pp. 54*).—The recipes, food quantities, and menus, and the general suggestions given conform to a weekly expenditure of approximately 8s. ($2) per person.

**Hot lunches in rural schools**, S. LAIRD (*Jour. Agr. and Hort., 22 (1919), No. 9, pp. 144, 145, figs. 3*).—A plea for the hot lunch in rural schools, with suggestions for necessary equipment and supplies. Some account is given of such school lunch work in Canada.

**Health without meat**, H. E. MILES (*London: Methuen & Co., Ltd., 1918, 5. ed., pp. 134, figs. 5*).—Essentially a cook book for an egg-lacto-vegetarian diet, with assertions and statements from this standpoint as to methods of saving food and of providing substitutes for meat.

**Study of the intestinal contents of newly born infants**, A. HYMANSON and M. KAHN (*Amer. Jour. Diseases Children, 17 (1919), No. 2, pp. 112–117*).—From the analyses of the meconium of 5 infants voided during the first 24 hours of extrauterine life, it was found that the iron and calcium contents were similar to those obtained in hunger feces, while the phosphorus was less and the sulphur more. Traces of ammonia and amylase were found, but lactase, trypsin, erepsin, and lipase were absent.

**Influence of phlorizin on the energy metabolism**, P. HÁRI and Z. ASZÓDI (*Biochem. Ztschr., 87 (1918), No. 3–4, pp. 176–216*).—Experiments on laboratory animals (dogs and rats) indicate, in the opinion of the authors, that the body temperature and energy metabolism are noticeably increased in the case of dogs and decreased in the case of rats by subcutaneous injections of small amounts of phlorizin. The destruction of protein is greatly increased in both cases. As the increased protein diet, in the case of rats, is accompanied by lowered heat production, the increased heat production in the case of dogs can not be due to the increased protein destruction. Further investigation is needed to explain this difference.

**The hospital metabolic laboratory**, F. A. FORD (*Candle of Phi Upsilon Omicron, 4 (1918), No. 1, pp. 26–29*).—A discussion of the hospital metabolic laboratory, with reference to the advantages it offers to persons interested in hospital dietetics.

## ANIMAL PRODUCTION.

**Analysis of feeding stuffs**, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 187 (1918), pp. 20*).—Report is made on 288 samples of feeding stuffs collected during the 1918 inspection. Proximate analyses—mostly without crude fiber determinations—are reported of wheat bran, middlings, shorts, red dog, wheat mixed feed, corn gluten feed, hominy feed, oat feed, oat hulls, barley screenings, linseed meal, ground oil cake, cottonseed meal, cottonseed feed, peanut oil meal, unhulled peanut oil feed, peanut meal and hulls, dried beet pulp, alfalfa meal, meat scrap, and numerous proprietary stock feeds, calf meals, and poultry feeds. A compilation of the manufacturers' statements as to the ingredients in a number of these proprietary feeds is also given.

**Cattle feeding.—XIV, Winter steer feeding, 1917–18**, J. H. SKINNER and C. G. STARR (*Indiana Sta. Bul. 220 (1918), pp. 26, fig. 1; popular ed., pp. 7, fig. 1*).—To make a further study of limited corn rations for fattening cattle in continuation of work previously noted (E. S. R., 38, p. 873), and to compare the feeding value of silage made from corn and soy beans with that of ordinary corn silage, 69 two-year-old steers divided into 7 lots were included in a 120-day feeding trial beginning December 13, 1917. Lot 4 was given what was considered a medium corn ration, 12 lbs. per head daily except during the

first few weeks. Lot 3 received half this amount, lot 2 no corn, and lot 1 corn only during the last third of the trial. In addition these animals received cottonseed meal (2.5 lbs. per 1,000 lbs. live weight, daily), good corn silage, and clover hay. The 3 other lots were kept on a medium corn ration. Two were fed corn-and-soy bean silage, and the third corn silage. The latter lot and one of the mixed-silage lots received no concentrates other than shelled corn. As to the character of the mixed silage, the following remark is made: "The corn and soy beans were grown separately and the two crops were mixed at the cutter in the proportion of two parts by weight of green corn and one part green soy beans. The corn used was similar in yield and stage of maturity to that used for the straight corn silage. The soy beans were still green, no pods having turned brown, but the beans were well formed in the pods and the leaves were turning yellow."

The results are summarized in the following table:

*Tests of corn ration, kind of silage, and use of protein supplements in steer feeding.*

| Lot. | Average daily corn ration. | Initial weight per head. | Average daily gain per head. | Feed consumed per pound of gain. | | | | | Estimated selling price per hundred. | Profit per head excluding pork. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Corn. | Cottonseed meal. | Corn silage. | Mixed silage. | Clover hay. | | |
| | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | | |
| 1 | [1] 4.15 | 1,050 | 1.77 | 2.34 | 1.58 | 26.8 | ..... | 2.26 | $14.85 | $34.62 |
| 2 | ..... | 1,050 | 1.66 | ..... | 1.69 | 32.6 | ..... | 2.51 | 14.55 | 35.55 |
| 3 | 5.42 | 1,046 | 1.87 | 2.90 | 1.52 | 24.4 | ..... | 2.48 | 14.85 | 32.88 |
| 4 | 10.73 | 1,047 | 2.40 | 4.48 | 1.21 | 16.0 | ..... | 1.79 | 15.35 | 39.85 |
| 5 | 10.73 | 1,044 | 2.30 | 4.66 | 1.26 | ..... | 17.0 | 1.96 | 15.25 | 36.02 |
| 6 | 11.65 | 1,042 | 1.92 | 6.07 | ..... | ..... | 19.1 | 2.26 | 14.35 | 25.86 |
| 7 | 11.65 | 1,044 | 1.79 | 6.50 | ..... | 20.7 | ..... | 2.38 | 14.65 | 27.44 |

[1] Received no corn first 80 days.

Corn was charged at $1.12 per bushel and cottonseed meal at $53.50, clover hay $25, and both kinds of silage $7.50 a ton. At these prices lot 2 produced a pound of gain most cheaply and lot 4 next, but owing to low total gains and decreased finish, lot 2 was not as profitable as lot 4. A table gives the necessary selling prices per hundred pounds of lots 1 to 4 under changing corn prices. In this table the price of a ton of silage is put at $1 more than five times the cost of a bushel of corn.

No conclusive differences were found between the two kinds of silage. Comparing lots 4 and 5 with lots 7 and 6, respectively, it appears that the omission of a protein supplement decreased the economy of gain, the finish of the animals, and the profits per head.

Hogs ran with each lot and the data on pork produced, grain consumed by the hogs, and the profits from pork are included. Since varied amounts of corn were given the hogs of different lots and in some cases shorts and tankage, exact comparison of the lots with respect to amounts of pork can not be made.

Cattle feeding investigations (*Kansas Sta. Rpt. 1918, pp. 40–42*).—Continuing past practice (E. S. R., 40, p. 369) calves from the Fort Hays substation were fattened for baby beef at Manhattan during the winter. Five lots, each consisting of 6 steers and 4 spayed heifers, were fed for five months. The check lot received the following approximate daily ration: Shelled corn 10 lbs., linseed meal 1.7 lbs., immature corn and Kafir corn silage 10 lbs., and alfalfa hay 4.5 lbs.; the others, some variant of this. A ration in which the corn was ground produced slightly greater gains and more finish than the check ration and the added profit more than offset the cost of grinding. A lot receiving cottonseed meal instead of linseed meal showed inferior finish, although the

gains were only slightly decreased. "Until the end of the third month the calves receiving cottonseed meal had gained more than any other lot and showed as much finish, but from that time on cottonseed meal did not seem to stimulate the appetite as did linseed meal with the result that they would not eat as much feed and could not make the gains."

A lot receiving no silage, but nearly doubling the alfalfa consumption of the check lot, made the least profit per calf of any lot, due partly to the difference in prices charged for alfalfa and silage, and partly to lower gains. A lot receiving neither silage nor supplement but over twice the check ration of alfalfa made the slowest gains of any lot and next to the lowest profits.

**The utilization of Yucca for the maintenance of cattle,** J. M. JONES and A. B. CONNER (*Texas Sta. Bul. 240 (1918), pp. 5–23, figs. 9*).—This bulletin includes descriptions of nine species of plants of the Yucca family occurring on the southwestern cattle ranges in large enough numbers to be of importance as emergency feed for cattle, proximate chemical analyses made at the Texas and New Mexico Stations of the heads, stems, leaves, etc., of soapweed (*Y. elata*), Spanish dagger (*Y. macrocarpa*), bear grass (*Y. glauca*), and sotol (*Dasylirion* sp.), statements as to successful methods of cutting and feeding the material, particularly those developed on the Jornada Range Reserve (E. S. R., 40, p. 471), and a reprint of a press bulletin account of feeding experiments with Yucca and sotol at the New Mexico Station, since reported in greater detail (E. S. R., 40, p. 277).

**Sheep feeding.—VIII, Fattening western lambs, 1917–18,** J. H. SKINNER and C. G. STARR (*Indiana Sta. Bul. 221 (1918), pp. 20; popular ed., pp. 7, fig. 1*).—To study (1) the effect of shearing lambs a short time before marketing, (2) the possibility of confining grain feeding to the end of the fattening period, (3) the use of hominy feed as a substitute for corn, and (4) the value of linseed meal as a protein supplement, as well as to secure data in addition to those reported in the preceding number of this series (E. S. R., 38, p. 670) on soy beans as a protein supplement, and the effect of restricting the dry roughage and increasing the silage, 7 lots of 25 lambs and one of 24 lambs were fed for 90 days beginning October 28, 1917. The check lot received shelled corn and cottonseed meal (7:1), with corn silage and clover hay twice daily, and was sold unshorn. The modifications of this treatment accorded the other lots and the more important results secured are shown in the following table. Grain and supplement were fed mixed in the same proportions to all except the lot with initial no-grain period which always received its cottonseed meal (0.25 lb. per head per day) with the silage. During the first few days all the lambs, barring those in the last named lot, were given a certain amount of oats, totaling about 11 lbs. per head, to accustom them to grain feeding.

*Results of a 90-day lamb feeding trial.*

| Lot. | Variation in treatment. | Initial weight per head. | Average daily gain per head. | Feed consumed per pound of gain. | | | | Profit or loss per head. |
|---|---|---|---|---|---|---|---|---|
| | | | | Grain. | Supplement. | Silage. | Hay. | |
| | | *Lbs.* | *Lb.* | *Lbs.* | *Lb.* | *Lbs.* | *Lbs.* | |
| 7 | Check lot | 55.9 | 0.281 | 2.97 | 0.52 | 5.48 | 2.28 | +$0.10 |
| 2 | Clipped after 75 days | 56.2 | .238 | 3.51 | .62 | 6.27 | 2.70 | −1.19 |
| 3 | Hominy feed in place of corn | 56.0 | .281 | 2.93 | .52 | 5.20 | 2.27 | + .23 |
| 4 | No grain first 40 days | 56.0 | .278 | 2.45 | .81 | 6.34 | 2.69 | + .06 |
| 5 | Linseed meal as supplement | 56.3 | .283 | 2.94 | .52 | 5.38 | 2.26 | + .29 |
| 8 | Ground soy beans as supplement | 56.2 | .280 | 2.97 | .52 | 5.52 | 2.29 | + .03 |
| 1 | Hay first 3 weeks only | 56.0 | .231 | 3.61 | .64 | 8.59 | .86 | − .40 |
| 6 | Hay every fifth day | 56.0 | .260 | 3.21 | .57 | 7.15 | 1.24 | − .10 |

Owing to market conditions current at the time, these feeding operations were conducted without margin. The selling price assigned the check lot was $17 per hundred pounds. The low average gains of the clipped lambs resulted directly from decreased consumption of silage following shearing; they were greatly discriminated against in selling.

In spite of the fact that corn was charged at 2 cts. and hominy feed at 3 cts. a pound, the lambs fed the latter showed greater profit due to more economical gains and an increased selling price of 10 cts. a hundred. Part-time grain feeding resulted in a feed cost lower than the check lot by about 12 cts. a head, but the smaller gains and a 15-ct. decrease per hundred in selling price produced less profit.

Linseed meal and ground soy beans were each charged at $60 per ton as against $53.50, the purchase price of cottonseed meal. Soy beans were identical with the latter in feeding value, and the selling prices of the two lots were the same. The difference in profits reflects the difference in cost of feeds. The increased profit from the linseed meal lot was due partly to an added selling price of 25 cts. per hundred and partly to more economical gains.

Clover hay was valued at $25 and corn silage at $7.50 per ton, but neither the feeding of hay every fifth day only, thereby cutting the consumption in half, nor the complete elimination of hay after the animals were on full feed was profitable, because of reduced gains.

**Feeding western lambs** (*Kansas Sta. Rpt. 1918, pp. 42, 43*).—Five lots of 60 lambs each were fed for 60 days during January and February, 1918. Comparisons were made between shelled corn and whole Kafir corn, alfalfa hay and sweet clover hay, silage and no silage. One lot was crowded. Results from the others are summarized as follows:

*Results of a 60-day lamb feeding experiment.*

| Lot number. | Kind of grain and hay fed. | Initial weight per head. | Average daily gain per head. | Feed consumed per pound gain. | | | Feed cost per pound of gain. | Profit or loss per lamb. | Market grade. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Grain. | Hay. | Silage. | | | |
| | | *Lbs.* | *Lb.* | *Lbs.* | *Lbs.* | *Lbs.* | *Cts.* | | |
| 16 | Corn, alfalfa | 61.2 | 0.44 | 3.2 | 4.0 | ..... | 14.6 | +$0.40 | Prime. |
| 17 | Corn, sweet clover | 61.2 | .37 | 3.7 | 2.7 | 2.2 | 15.2 | + .02 | Choice. |
| 18 | Corn, alfalfa | 60.4 | .39 | 3.5 | 2.4 | 2.1 | 14.4 | + .23 | Do. |
| 19 | Kafir corn, alfalfa | 59.9 | .41 | 3.4 | 4.2 | ..... | 17.0 | — .50 | Good. |

The following prices were charged for feeds: Corn 3 cts. and Kafir corn 3.5 cts. per pound, hay $25 and silage $8 per ton. It is computed that the value of Kafir corn as feed for lambs was only 2.9 cts. per pound, while corn in lot 16 was worth nearly 3.5 cts.

**Production of goats on far western ranges,** W. R. Chapline (*U. S. Dept. Agr. Bul. 749 (1919), pp. 35, pls. 12, figs. 2*).—A number of problems associated with range goats are considered in some detail, particularly with reference to (1) character of the range, (2) methods of management that will insure profits from goats without interference with sheep and cattle raising, timber reproduction, watershed protection, or other uses of the range, and (3) increasing the amount of mohair and goat meat by reducing death losses and by exercising greater care in the selection and management of the herd. The publication constitutes a general treatise on the management of goats on the range.

**The utilization of irrigated field crops for hog pasturing, F. D. Farrell** (*U. S. Dept. Agr. Bul. 752 (1919), pp 37, figs. 6*).—This bulletin reviews 149 tests with hogs on irrigated pastures, involving a total of 3,795 animals, conducted by the Bureau of Plant Industry on various western reclamation projects. Most of these tests were made during the years indicated at experimental farms on (1) the North Platte project at Scottsbluff, Nebr. (1913–1916); (2) the Huntley, Mont. project (1913–1916); (3) the Belle Fourche, S. Dak. project (1914–1916); and (4) the Truckee-Carson, Nev. project (1915–1918). Less comprehensive experiments at the experimental farms of the Umatilla, Oreg. and Yuma, Ariz. projects are also reported. Practically all the tests conducted on the experimental farms have been previously noted from the annual reports of each farm and a summary of the Scottsbluff results through 1915 has been published separately (E. S. R., 36, p. 767). Additional details of the tests are given in the present compilation and in some cases different and, presumably, revised data. The other tests summarized were conducted in cooperation with farmers located on the North Platte, Tieton, Uncompahgre, Boise, and Minidoka projects.

Pasturing alfalfa without supplementary feed seldom proved satisfactory. Hogs on alfalfa pasture with a 2 per cent grain ration produced about 2,500 lbs. of pork per acre in a season and consumed from 2.5 to 3 lbs. of grain per pound of gain.

"The feeding values of corn, barley, shorts, and milo [maize] as supplements to alfalfa pasture differ from one another so little that the choice among these supplements should depend on prices, cultural adaptability, and general economic conditions. When the grain supplement is to be produced by the swine grower, preference usually should be given to corn, barley, and the grain sorghums, depending on the adaptability of each of these crops to local conditions in each instance.

"An acre of good alfalfa pasture supplemented with as much as a 2 per cent ration of grain has an average hog-carrying capacity of about 2,500 lbs. of live weight for the growing season. Carrying capacity increases rapidly with increased grain allowance, and it varies somewhat during the growing season with the rate of crop growth.

"An acre of good alfalfa pasture, if supplemented with a 2 per cent ration of corn or barley, will support 6 to 8 sows and 50 to 70 suckling spring pigs for a period of about 60 days in early summer, during which time the pigs should gain 25 to 30 lbs. each. At the close of this period the pigs should be ready to go into alfalfa pasture by themselves for the remainder of the growing season. The few tests so far conducted indicate that white sweet clover is not to be regarded as a rival of alfalfa as hog pasture.

"The gains made in the tests of hogging corn reported in this bulletin ranged from 183 to 1,048 lbs. per acre of corn when no supplementary feed was given and from 335 to 1,377 lbs. per acre where the corn was supplemented. It is estimated that in these tests an average of about 450 lbs. of corn was required to produce 100 lbs. of gain when no supplement was used, as compared with an average of 409 lbs. when the corn was supplemented with tankage, late alfalfa pasture, or rape. Alfalfa pasture is to be preferred as a supplement to corn in hogging off enterprises on irrigated lands because of its cheapness and reliability.

"The tests reported show that field peas have a high value as an irrigated crop to be hogged off. The gains in live weight per acre of peas in 17 tests ranged from 250 to 949 lbs., averaging in the neighborhood of 600 lbs. These results compare not unfavorably with those obtained by hogging corn, when the costs of production of these crops are considered."

[Feeding experiments with swine] J. M. HUNTER (*New Jersey Stas. Rpt. 1917, pp. 107–121*).—Summaries of 4 swine feeding experiments are presented, mostly in continuation of work previously noted (E. S. R., 39, p. 777).

A comparison of self-feeding and hand-feeding of concentrates when forage crops were also fed was made with two groups of 24 weanling pigs, averaging 49 lbs. in weight, from June 14 to October 1, 1916. Each group was divided into 4 equal lots, treated similarly. One group had free choice of shelled corn, wheat middlings, and tankage (60 per cent), the other was fed a 2 per cent ration made up of these feeds in proportions that varied somewhat from lot to lot. The self-fed group made a total average gain per pig of 106 lbs. at a cost per pound of 3.2 lbs. of feed. The hand-fed group gained only 70.4 lbs. per pig and consumed 1.8 lbs. of feed per pound of gain. There were considerable differences between lots within a group. On October 2, when the forage season was over, certain pigs of both groups that had not attained a weight of 200 lbs. were given free choice of corn and tankage. By December 12, the continuously self-fed pigs averaged 56.6 lbs. increased weight and had consumed 5.2 lbs. of feed per pound of gain. The pigs previously hand-fed had gained an average of 41.25 lbs. by the same date at a cost of 7.5 lbs. of feed per pound of gain.

A second trial with blackstrap molasses as a substitute in whole or in part for corn in a ration for brood sows is reported, 4 lots of 6 sows, 2 to 4½ years old, being used. The lots fed corn meal and molasses and hominy feed and molasses did about as well as the lot fed corn without molasses. A lot not receiving any corn but a larger amount of molasses and with the proportions of other feeding stuffs altered to secure the same nutritive ratio and the same amount of digestible nutrients in the rations, gained at a much slower rate, and showed a tendency to scour.

A single test with 7 sows and their pigs seems to indicate that young growing pigs can not make satisfactory gains when fed out of doors during the winter and housed in an A-shaped colony house.

Forty fall pigs averaging 42 lbs. in weight were divided into 4 equal lots for a test of fattening rations fed free choice. Apparently the length of trial varied in the different lots, and the exact basis of comparison is not altogether evident. In the order of increasing time estimated as necessary for the pigs to attain a weight of about 200 lbs., the rations tested ranked as follows: (1) Shelled corn, wheat middlings, tankage, and skim milk, (2) corn, middlings, and tankage, (3) corn and tankage, and (4) corn, middlings, tankage, and ground alfalfa. The low average gains on the last-named rations are attributed partly to the influence of a single pig that remained stunted throughout, "yet the fact remains that ground alfalfa is not relished by young fattening pigs having access to the self-feeder containing the above-mentioned feeds. When 2 lbs. of ground alfalfa is all that pigs at 100 to 150 lbs. will consume per day it is not likely that such a small amount would effect any considerable saving or tend to cheapen the ration. It may be possible that ground alfalfa lessens the appetites of pigs on the self-feeders."

[Mineral nutrients and corn in swine feeding] (*Kansas Sta. Rpt. 1918, pp. 13–17*).—The two lines of work already noted (E. S. R., 40, p. 371) have been continued.

Study of the influence of low-ash rations on pregnant sows was made with 14 animals, 10 being survivors of the preceding year's work. Eight sows fed ground corn alone with either tap or distilled water produced 14 dead pigs and 39 living ones, of which only 6 lived for 2 months. Three sows fed corn, corn gluten meal, and blood meal produced 21 dead pigs and no living ones.

These sows fed corn, shorts, and tankage produced 1 dead pig and 21 living ones, all still alive at weaning, 60 days afterwards.

Study of the effect of protein and ash supplements to corn in the fattening ration was made with 36 Duroc-Jersey pigs weighing at the start about 54 lbs. a head and divided into lots of 6 each. The feeding methods are judged largely by the time necessary for the pigs to gain 150 lbs. Seven lots were fed on alfalfa pasture, and 4 in dry lots. Of the former, the 3 lots to which corn was the only concentrate took longest (194 to 197 days) to attain the desired weight. Additional ash had no apparent influence. The most rapid gains (97 days) were made by a lot in which 6 per cent of the concentrate was tankage and which had access to extra mineral materials. A lot to which shorts and tankage (4:1) formed 20 per cent of the grain ration gained 150 lbs. per head in 99 days. Two self-fed lots, one with corn, shorts, and tankage and the other with corn, tankage, and additional ash, required 109 and 101 days, respectively. Three of the lots not on pasture received shorts and tankage (4:1) as supplement to corn. A feeding period of 112 days was required for two whose grain rations were 70 and 80 per cent corn, respectively, and a period of 105 days for the other in whose ration the proportion of corn was gradually changed from 40 to 80 per cent. The fourth lot not on pasture had free choice of corn, shorts, and tankage and needed 104 days' feeding. Shorts and tankage were consumed approximately in the proportion of 5:1 and formed about 20 per cent of the ration.

Feeding value of skim milk for swine, H. W. Norris, Jr. (*Rhodesia Sta. Spec. Bul. 32 (1915), pp. 7*).—This is an amplification of an earlier study (E. S. R., 40, p. 73) of the combined results of numerous swine feeding trials at various experiment stations. It is computed that a pound of any of the following-named supplements would replace the designated amount of grain: Skim milk 0.25 lb., tankage 2.50 lbs., middlings 1.66 lbs., linseed meal 2.32 lbs., and soy-bean meal 2 lbs. A table gives the change in money value for some feeding of skim milk as the prices of the other supplements vary. Buttermilk is considered to be equal in feeding value to skim milk, and whey about half as efficient.

An experiment comparing velvet bean meal, tankage, and soy bean meal as supplements to corn meal in feeding hogs, E. S. Dana and L. E. Mayo (*Kentucky Sta. Rpt. 26 (1913), pp. 21*).—A lot of 8 Duroc-Jersey and Berkshire shotes, each weighing originally about 125 lbs., was fed on corn meal and velvet bean and hull meal (7:1), another on corn meal and tankage (6:1), and a third on corn meal and soy bean meal (7:1), for 80 days. The average daily gains were, respectively, 2.8, 1.72, and 1.82 lbs. per pig, and the corresponding amounts of feed consumed per pound of gain were 4.3, 4.2, and 4.3 lbs. Although the velvet beans were much cheaper than tankage or soy beans, they were fed at a distinct loss. The velvet bean ration had a wider nutritive ratio than the others, but it was impracticable to increase the proportion of velvet beans since the mixture as it stood was unpalatable, due presumably to the high crude fiber content. It is suggested that a velvet bean meal made from the kernels only would be a more useful feeding stuff to place on the market. The value of soy beans as a supplement to corn is pointed out, and analyses of velvet bean meal and tankage are reported.

Inheritance investigations in swine (*Texas Sta. Rpt. 1915, pp. 23, 24*).—The following results are claimed from cross breeding experiments with native, the Berkshire and Polled Angus: (1) White Berkshire dominates in pigmentation (Duroc-Jersey) and in narrow forehead (Tamworth, wild hog), (2) straight face (Tamworth, wild hog) dominant to dish (Berkshire), (3)

long face (Tamworth) completely dominant to short face (Berkshire), and (4) erect ear (Berkshire) dominant to drooping ear (Duroc Jersey).

**Experimental work [with poultry]** H. R. LEWIS (*New Jersey Stas. Rpt. 1917, pp. 135–175, fig. 1*).—The following research projects with poultry are briefly outlined but without the presentation of results other than general progress reports similar to those previously noted (E. S. R., 39, pp. 780, 781). Distribution and inheritance of fecundity, inheritance of plumage color, variation and inheritance of eggshell color, sequence of sex, strain test of Single Comb White Leghorns, nutrition studies with concentrates of animal origin, effect of time of hatching upon the molt and seasonal distribution of egg production, the elaboration of growth and production standards, and the home preservation of eggs. A section on the amount and causes of embryo mortality presents detailed results which have been previously noted from another source (E. S. R., 38, p. 876).

A survey of 14 of the large commercial poultry breeding farms in New Jersey during the year 1915–16 is reported. These farms apparently did not form part of a larger survey with which the author was connected (E. S. R., 40, p. 570). The labor incomes of farms maintaining less than 1,000 birds averaged $660, of those maintaining 1,000 to 2,000 birds, $3,191, and of those with more than 2,000 birds, $9,606. The annual production per bird for the three classes of farms were, respectively, 134, 145, and 125 eggs.

A study is undertaken of the errors incident to the use of production records of pens of laying birds in experimental work. Data are presented showing how differences between groups due to inherent differences in capacity might be attributed to the experimental procedure. A numerical method differing considerably from usual statistical practice is proposed for the correction of such errors. It is also suggested that many errors could be avoided by doing the experimental work with second-year birds, assignments to lots being based upon the trap nest records of the pullet year.

A tabulation is presented by months during the year 1916–17 of prices of eggs and market fowl in New York City. To some extent this is a continuation of data previously furnished by the author (E. S. R., 38, p. 373).

**Effect of certain grain rations on the growth of the White Leghorn chick,** G. D. BUCKNER, E. H. NOLLAU, R. H. WILKINS, and J. H. KASTLE (*Jour. Agr. Research [U. S.], 16 (1919), No. 12, pp. 305–311, pl. 1*).—Some unexplained results from feeding grain mixtures containing soy beans to growing White Leghorn chicks at the Kentucky Experiment Station are reported. The experiments originated from an observation that 1-day-old chicks failed to grow when fed ground soy beans and ground oats (1:2), protein-free milk, sprouted oats, cabbage leaves, grit, oyster shell, and sour skim milk.

A group of 11 chicks fed equal parts of soy beans, oats, wheat, shipstuff, sunflower seed, and cracked corn, with the addition of some skim milk, sprouted oats, shredded cabbage, grit, and oyster shell, grew from an average weight of 48 gm. to 490 gm. in 9 weeks, approximately a normal growth, but the animals were subnormal in vigor. Two died during this period. A similar group of 12 chicks were fed at the same time on the same ration except that the grain had been baked at 420° F. Eight died in 9 weeks, but the average weight of the survivors was 566 gm.

In a more elaborate experiment, 3 lots of 60 chicks each were used. The control (lot 3) received the so-called Cornell ration (E. S. R., 29, p. 273) and attained an average weight of 1.36 kg. (3 lbs.) at the end of 28 weeks. Lot 1 was fed the growth-promoting high-lysin ration previously studied by three of the authors (E. S. R., 34, p. 871) with the addition of soy beans in the mash

and scratch. The chicks averaged 1.24 kg. at 28 weeks and the cockerels particularly were consistently somewhat less vigorous than the controls. Secondary sexual characters and sexual instincts developed normally. Lot 2 had access to dry mash of ground barley, rice, hominy, and oats (in equal parts), and was given a scratch of barley, rice, and hominy. Enough butter fat and gluten flour were added to the mash and scratch to make them equal in protein and fat content to the mash and scratch fed lot 1. Once a day a wet mash composed of the grain mixture and protein-free milk was fed. This lot made much less than normal growth, the average weight at 28 weeks being only 800 gm. The external sexual characteristics were rudimentary and the feather tracts were not properly developed. Only 19 survived the 28 weeks. "The chicks of lot 2 seemed to have a good appetite, and while they ate with apparent avidity, yet they always seemed to be in search of something in their feed which they could not find. Regarding their ration, it will be seen that it is satisfactory with respect to every necessary dietary factor except the quality of protein. We are unable at this time to show wherein these proteins are limited, but hope to be able to prove this by experiments which are now in progress."

Protective feeds for poultry, H. R. LEWIS (*New Jersey Stas., Hints to Poultrymen, 7 (1919), No. 7, pp. 4*).—Average weights in successive weeks until the twenty-fourth after hatching are given for two groups of chicks, one grown at New Brunswick, N. J., under customary "normal" conditions without milk products in the diet, the other at Vineland, N. J., for contest purposes, with dried buttermilk in the mash, infertile incubator eggs to eat, fluid buttermilk to drink, and an alfalfa pasture as range. Breeds of the American class and Leghorns are treated separately in each group.

The Vineland chicks in both cases made distinctly the better growth, were for a considerable period during the second and third months at least 50 per cent heavier than the New Brunswick chicks, and attained the last recorded weights of the latter about a month earlier. The success of the Vineland group is attributed to the generous supply of vitamins in their feed. Poultrymen are advised to consider recent discoveries as to the dietary needs of growing animals.

[Inheritance of color in Andalusian fowl] (*Kansas Sta. Rpt. 1918, p. 45*).—It is stated that further study of the genetics of Andalusian blue in continuation of work already noted (E. S. R., 39, p. 877) makes it desirable to postulate a fourth factor for feather color, namely, a factor responsible for black lacing on the contour feathers.

Improvement and conservation of farm poultry (*Kansas Sta. Rpt. 1918, pp. 43–45, fig. 1*).—The annual egg records of mongrel pullets and of their pullet descendants after three generations of top crossing with pure-bred males are compared. The records of Barred Plymouth Rock grades averaged 207.3 eggs, of Single Comb White Leghorn grades 198 eggs, and of White Orpington grades 111.25 eggs. The average records of the great granddams were 104.5, 74.5, and 123.5 eggs, respectively. A check lot of mongrels not crossed with improved stock increased their average record in three years from 101.7 to 129.6 eggs.

The Vineland international egg-laying and breeding contest, H. R. LEWIS (*New Jersey Stas. Rpt. 1917, pp. 177–184, 185–187*).—This is a statement of the first year's results of the Vineland contest, presenting certain material not given in a previously noted publication (E. S. R., 38, p. 677), including the individual annual egg records of the 10 hens in each of the 100 pens.

Report of the second (yearling) year of the Vineland international egg-laying and breeding contest, R. R. HANNAS (*New Jersey Stas., Hints to Poultrymen, 7 (1919), No. 4, pp. 4*).—This is a preliminary report of the second year

of a three-year contest. A similar report of the first year has been noted (E. S. R., 38, p. 677). A list of 99 pens classified as to breeds is given, together with the egg production of each pen during both years and the name of the exhibitor. General notes on feeds consumed, mortality, hatching, and brooding are included. "The data obtained this year show that a hen eats practically as much feed as does a pullet, but she requires a different balancing of the food materials to maintain a high production, requiring nearly twice as much mash, the real egg food, as grain."

The ratio of weight of eggs to weight of feed was 1 : 4.35 in the case of Leghorns and 1 : 5.65 in the case of the heavy breeds (Plymouth Rocks, Wyandottes, and Rhode Island Reds).

**Lessons to be learned by keeping records**, V. G. AUBRY (*New Jersey Stas., Hints to Poultrymen, 7 (1919), No. 5, pp. 4*).—Tabulations are given by months of the average results secured by 32 poultrymen who by agreement handled their flocks for a year substantially according to the methods advocated by the station. Data on amounts and costs of feeds, production percentage, prices received for eggs, and profits are included. It is thought that these figures provide a normal standard whereby any poultryman who keeps records can discover whether he is securing satisfactory returns from his efforts.

**The incubator egg**, R. R. HANNAS (*New Jersey Stas., Hints to Poultrymen, 7 (1919), No. 6, pp. 4*).—Directions are given for caring for eggs before and during incubation. The importance of individual differences in hens with respect to hatching percentage of their eggs is recognized.

**Marketing of dressed poultry** (*Kansas Sta. Rpt. 1918, p. 46*).—Progress in this investigation during the year, in continuation of work previously noted (E. S. R., 40, p. 372), is said to warrant the following conclusions:

"(1) Quantitative bacteriological determinations are not an index to spoilage. (2) The most important accumulations of bacteria are in the intestinal tract and the skin. There is evidence that the skin flora plays a more important rôle than was formerly considered. (3) The intestinal tract gives rise to bad odors and volatile products most rapidly; the liver next, the skin next, if kept moist, and the muscles last. Nothing has been found to keep down the development of bad odors without injuring the appearance and texture of the skin."

## DAIRY FARMING—DAIRYING.

**Winter rations for dairy heifers**, C. H. ECKLES (*Missouri Sta. Bul. 158 (1918), pp. 3–54, figs. 16*).—This bulletin compares 15 rations with reference to their value and economy in promoting growth of dairy heifers during the winter months, and is based upon 76 individual feed and growth records of heifers. Seventeen of the animals were included in the light-fed group of heifers forming a part of a previous investigation (E. S. R., 34, p. 378). The others were used in a series of feeding experiments conducted annually each winter from 1913–14 to 1917–18 and not hitherto reported in detail. Of the total number of heifers, 31 were Jerseys, 34 Holsteins, and 9 Ayrshires. One of the Jerseys and one of the Holsteins were used two seasons. For each of these animals the following data are published: Age at the beginning of winter feeding, the average daily consumption of each feeding stuff offered, the digestible crude protein, and the net available energy of the daily rations (based respectively upon the average figures published by Henry and Morrison and by Armsby), the initial weight and height at withers, the normal weight and height for animals of the same breed and age, the daily gain in weight, the total gain in height, and the gains in weight and height to be expected of similar heifers under normal conditions. The Jerseys varied in age at the start from 6 to

20 months, the Holsteins from 7 to 21 months, and the Ayrshires from 9 to 15 months. The feeding periods were mostly 5 months. The data on normal growth are taken from those accumulated at the Missouri Station; they are still incomplete for animals approaching maturity and have been published only in part (E. S. R., 40, p. 877). Difficulties arising from differences in age and condition were largely overcome by using these normal figures as the basis of comparison.

The combinations of feeding stuffs compared include (1) alfalfa hay alone, (2) alfalfa and silage, (3) alfalfa and corn, (4) clover hay and corn, (5) silage, alfalfa, and corn, (6) silage, timothy hay, and corn, (7) silage, corn, and cotonseed meal, and (8) silage, timothy, corn, and cottonseed meal. A variety of different proportions of grain and roughage were tested. It was found that animals fed a ration which resulted in heavy gain during the winter made only small gains the following summer on pasture. When the winter ration was so meager that the animals were low in vitality in the spring fairly large gains were produced on summer pasture, but in most cases they were not large enough to compensate for the small winter gain. Neither extreme in winter feeding is considered economical. The best results, it is held, follow a winter ration that keeps the animal in moderate flesh and produces growth as nearly normal as possible. It was found that normal growth may be obtained from rations furnishing considerably less protein than that prescribed by the Wolff-Lehmann standard.

Of the 17 heifers wintered on alfalfa alone, only 2, both rather mature, made a gain in weight equal to normal. "Although alfalfa is probably the most palatable roughage used for cattle in this country and the quality fed was of the highest, still animals did not consume enough to supply sufficient energy to allow for a greater growth."

The 15 heifers fed both silage and alfalfa made better gains than those fed alfalfa alone. The best gains occurred when both roughages were fed at will. On this ration animals more than 9 months old made practically normal gains. They consumed the silage and alfalfa in the proportion of 2:1. Younger calves needed grain in addition in order to grow normally.

"The most satisfactory ration of all those tried was silage at will, legume hay limited to about 6 lbs. daily, and 2 lbs. of corn daily. On this ration heifers of all ages thrived and made gains somewhat above the normal.

"Fair results may be obtained from silage alone for roughage, if legume hay is not available. In this case about 2 lbs. of concentrates should be supplied daily, of which one-half should be a high protein feed such as linseed or cottonseed meal, the remainder corn, or other grains if the cost is less a pound than for corn." The animals made better gains and seemed to be more contented if about 2 lbs. of timothy hay per day was added to a ration of silage and grain.

Alfalfa or clover hay fed at will with 2 or 3 lbs. of corn daily made a satisfactory ration for heifers of any age from 6 months to within a few weeks of freshening.

It is considered best to continue feeding grain to all heifers for a few months after the cessation of milk feeding. At a later age they can be fed exclusively on roughage if necessary without greatly retarding their growth. It appears that Holsteins are able to make more nearly normal gains on a ration composed mostly of roughage than are Jerseys.

**Dairy cattle feeding experiments**, P. V. Ewing, J. W. Ridgway, and W. A. Doubt (*Texas Sta. Bul. 238 (1918), pp. 5–14*).—Results of two studies are presented.

1. *Cottonseed meal v. peanut feed for milk production* (pp. 5–9).—Two lots of 6 cows each were fed alternately by the reversal method during four 3-week

periods on two grain rations, corn chop and peanut feed (1:1) and corn chop and cottonseed meal (3:2). The cows when on the peanut ration produced 178.7 lbs. more milk and 8.85 lbs. more butter fat than they did on the cottonseed meal ration, but owing to the fact that about 50 per cent more protein supplement was consumed, the increased production was not profitable, since peanut feed and cottonseed meal were purchased at almost exactly the same price. A third lot of 6 cows fed during the entire 12 weeks on corn chop, peanut feed, and cottonseed meal (6:3:2) produced 583 lbs. of milk and 1.08 lbs. of butter fat more than the other cows when on the cottonseed meal ration. The third ration is considered the most economical of those tested. In assigning the cows to lots, care was taken "to divide them as equally as possible with respect to age, production, size, feeding capacity, stage of lactation, and natural productive capacity."

Proximate analyses of the samples of peanut feed and cottonseed meal used are reported.

It is held that under Texas conditions, where proteins are generally cheaper than carbohydrates, the proper basis for comparing feeds is the percentage of total digestible nutrients, and not the protein content.

2. *Comparison of methods of preparation of velvet beans for dairy cows* (pp. 10–14). The grain mixture used in this experiment consisted of corn bran, cottonseed meal, and velvet beans (2:1:3), and the roughage of pasture. Each of four different ways of preparing the beans was tested in rotation with 4 lots of 3 cows, each lot receiving beans prepared by a particular method for 20 days. The amount of grain fed in each period was the same. The milk produced by the cows when the beans were fed whole totaled 6,337 lbs., when the beans were cracked 6,345 lbs., when cracked and soaked in water 6,398 lbs., and when ground 6,690 lbs. The feeding of cracked beans soaked, and of ground beans, was accompanied by an increase of 7 or 8 lbs. of butter fat. The increase in milk resulting from grinding was about 57 gal. for a ton of beans, which at 40 cts. a gallon is worth $22.80. Since mills will often grind the beans for $2.50 a ton, and the grinding can be done on many farms for $5, the operation is deemed distinctly profitable. No differences in palatability apparently resulted from the various methods of preparation.

Proximate analyses of the samples of corn bran, cottonseed meal, and velvet bean feed used are presented. The milk and butter fat records of each lot by 5-day intervals are also tabulated.

**Some aspects of the physiology of mammary secretion**, R. L. Hill (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 5, pp. 642–654*).—This paper repeats to some extent data already published (E. S. R., 32, p. 871) showing increased milk flow and fat yield in a goat as the immediate result of pituitrin injections, and includes confirmatory data from three other goats. Milk analyses which are published show that pituitrin has no influence on any of the milk solids except the fat.

**An exceptional case of milk secretion and its bearing on the theories concerning mammary development**, R. L. Hill (*Jour. Dairy Sci., 2 (1919), No. 1, pp. 19–27, figs. 3*).—The case is described of a doe kid at the Maryland Experiment Station, which was found to have well-developed mammae and an udder full of milk before she was 4 months old. The fluid had the normal composition of goat's milk. The animal was milked at intervals for about 6 months. That the lactation differed from a normal post-partum one is indicated by the fact that relatively long intervals, even 19 days, between milkings did not result in cessation of flow.

"This kid had not reached sexual maturity, so any theory of mammary growth or milk secretion involving the ovaries, corpora lutea, fetus, or placenta

is not applicable. The udder of this kid had not been massaged, suckled, or treated in any way to stimulate its growth or secretion. It is possible that some other of the internal secreting glands have a prominent part in regulating the growth and secretory activity of the mammary glands. There is some evidence [as noted above and in another publication of the author (E. S. R., 36, p. 573)] in favor of the theory that the pituitary body (hypophysis cerebri) may function in this way."

The milk analyses and the author's theory of colostrum formation are repeated from another paper (E. S. R., 38, p. 780). The literature on the physiology of milk secretion is reviewed.

**A new and powerful galactagogue**, C. H. DUNCAN (*N. Y. Med. Jour., 105 (1917), No. 1, pp. 22, 23*).—Several cases are cited in which the milk flow of the nursing mother (human) was apparently increased by subcutaneous injection of 1 cc. of her own milk. The statement is made that veterinarians have successfully treated cows by similar methods. "This treatment should be brought to the attention of the cattle raisers, stockmen, farmers, dairymen, etc., for if this treatment is judiciously given it will insure the animal giving the maximum amount of milk of which she is capable. . . . The writer suggests that practically every cow be treated as indicated to insure her doing her duty toward supplying milk."

**Milk as a galactagogue**, L. S. PALMER and C. H. ECKLES (*N. Y. Med. Jour., 108 (1918), No. 9, pp. 375, 376*).—The authors have attempted to verify the above-noted theory using cows of the Missouri Experiment Station herd. Two experiments were performed in which 20 cc. of milk from fresh heavy milking cows was injected subcutaneously on three successive days into the shoulders of cows advanced in lactation. The results were entirely negative. In a third experiment, after a cow was milked dry 20 cc. of milk was injected and the cow milked again in an hour, when 85 gm. of milk was secured. On the previous day the same procedure without injection resulted in 200 gm. of milk.

Since Duncan's treatment seems to have been most effective in cases of sudden cessation of milk flow the authors suggest that the injected milk served as a counterdepressant and not as a galactagogue.

**Principles and practice of milk hygiene**, L. A. KLEIN (*Philadelphia: J. B. Lippincott Co., 1917, pp. 320, figs. 40*).—This book is intended primarily as a text for students pursuing a course in milk hygiene.

**The utilization of dairy by-products**, E. KELLY (*Jour. Dairy Sci., 2 (1919), No. 1, pp. 46–49*).—Attention is called to the food lost to the people of the United States by the waste of skim milk, buttermilk, and whey, and general suggestions made regarding methods of utilization. It appears that only six States have laws requiring pasteurization of skim milk and whey destined for human consumption.

**The practical cultivation of the green mold (Penicillium glaucum) for making blue cheese**, R. CHAVASTELON (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 18, pp. 564–566*).—By the method proposed very thin slices of bread (wheat or rye) are soaked in a 35 per cent solution of tartaric acid, inoculated on both sides with Penicillium spores, kept on screens or straw mats (previously sterilized) in a moist atmosphere for a day or two, and then, when colored a uniform green, dried in the air and pulverized. Practically nothing is left by this time of the original bread and the residue consists almost exclusively of spores suitable for use in cheese making.

The method commonly used by makers of Roquefort cheese is to steep large pieces of rye bread in vinegar to which spores have been added, but this is considered undesirable aside from the waste of material since acetic acid is not so favorable a culture medium for Penicillium as for some other molds.

**Buttermilk cheese**, A. W. RUDNICK (*Jour. Dairy Sci., 2 (1919), No. 1, pp. 41–45, fig. 1*).—The author, working at the Iowa Experiment Station, finds that a satisfactory cheese can be made from pasteurized sour cream buttermilk by running the heated buttermilk through one of the commercial centrifugal machines now available for the extraction of curd from skim milk in the manufacture of cottage cheese.

The machine consists of a hollow cylinder open at the top except for a rim one-eighth of the diameter, supported by a spindle, and inclosed in an iron frame. The curd lodges under the rim. The casein content of the whey depends upon the acidity, temperature of heating, and duration of heating. When sour pasteurized buttermilk with a casein percentage of 2.69 was held one hour at 170° F. the whey tested 0.266 per cent. When it was held one hour at 140° F. the test was 0.319 per cent, and when heated to 170° F. but not held 0.397 per cent. The curd had the best grain after the buttermilk was held for one hour at 140°. Sour pasteurized buttermilk cheese prepared by the centrifugal method does not have the disagreeable taste resulting from the customary method of neutralization with sodium hydroxid and reacidulation with hydrochloric acid.

It is stated that the centrifugal machine will leave only 0.15 per cent of casein in the whey when buttermilk from pasteurized sweet cream is used. Such buttermilk held at 95 to 115° F. for an hour after the acidity has reached 0.65 per cent produces a cheese equal to cottage cheese in flavor and texture.

**The manufacture of condensed milk** (*So. African Jour. Indus., 1 (1918), No. 15, pp. 1447–1449*).—The preparation of condensed milk and milk powder is outlined.

## VETERINARY MEDICINE.

**Textbook of meat hygiene, with special consideration of ante-mortem and post-mortem inspection of food-producing animals**, R. EDELMANN, trans. by J. R. MOHLER and A. EICHHORN (*Philadelphia: Lea & Febiger, 1919, 4. rev. ed., pp. VI+17–472, pls. 5, figs. 161*).—The fourth revised edition of the work previously noted (E. S. R., 35, p. 678).

This work is based on the rules and regulations of the Bureau of Animal Industry of the U. S. Department of Agriculture, the latest regulations under Order 211 of this Bureau being incorporated. Throughout the book references are made to these regulations, especially with regard to the disposition of carcasses.

**Live stock sanitary laws and regulations of the State Board of Agriculture. Laws regulating the practice of veterinary medicine** ([*Baltimore*]: *Md. State Bd. Agr., 1918, pp. 39*).—The text of the laws is here brought together.

**Report of the New York State Veterinary College at Cornell University for the year 1917–18**, V. A. MOORE (*Rpt. N. Y. State Vet. Col., 1917–18, pp. 184, pls. 11*).—In addition to the report of the director of the college and others on the work during the year 1917–18, the following papers are presented: Researches in the Diseases of Breeding Cattle, by W. L. Williams and C. M. Carpenter (pp. 51–108); Handling an Outbreak of Calf Scours and Pneumonia, by C. M. Carpenter (pp. 109–118); The Paranasal or Facial Sinuses of Sheep, by G. S. Hopkins (pp. 119–121); The Anatomy of the Digestive Tract of Sheep, by E. Sunderville (pp. 122–127); Foreign Bodies in the Tissues with a Report of Six Cases, by S. A. Goldberg (pp. 128–137); Orokinase and Salivary Digestion in the Horse, Cow, and Pig, by B. J. Finkelstein (pp. 138–144); Certain

Aspects of the Pathology of Spavin (E. S. R., 39, p. 686), by S. A. Goldberg (pp. 145–148); A Preliminary Report on the Urine Analysis of the Dairy Cow, by C. E. Hayden (pp. 149–155); Horseshoes of Interest to Veterinarians, by H. Asmus (pp. 156–168); and The Strongylidæ Infesting the Horse, by W. A. Hagan (pp. 169–179).

**First biennial report of the [Utah] Live Stock Board for the period ending November 30, 1918**, R. W. HOGGAN ET AL. (*Bien. Rpt. Live Stock Bd. Utah, 1 (1917–18), pp. 23*).—This includes a discussion of the occurrence of and work with the more important diseases of live stock for the period ended November 30, 1918.

**[Diseases of live stock]**, A. H. CORY (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1917–18, pp. 64–67, pls. 6*).—A discussion of the occurrence of and work with ticks and tick fever and other diseases of cattle, including sheep, swine, etc.

**The physiological action of nitrobenzene vapor on animals**, W. L. CHANDLER (*New York Cornell Sta. Mem. 20 (1919), pp. 411–472, pl. 1*).—This is a report of investigations of the effect of nitrobenzene upon the host, conducted in continuation of the parasiticide investigations previously noted (E. S. R., 38, p. 760).

The work reported has confirmed the findings of previous investigators that (1) nitrobenzene exhibits toxic properties, whether it is ingested, applied to the skin, inhaled, or administered by subcutaneous injection; (2) the size of the lethal dose is extremely variable; (3) the symptoms of poisoning are inconstant; (4) an interval of time (the latent period) often elapses between the administration of the poison and the onset of the symptoms; (5) nitrobenzene is not necessarily converted in the body into anilin, hydrocyanic acid, or any other substance before it exerts a toxic action; and (6) nitrobenzene forms methemoglobin in the blood. It has also led to the following conclusions:

"Aside from the possible disturbance of digestive functions and a possible asphyxia due to a direct action of nitrobenzene on the blood, most, if not all, of the observed symptoms of nitrobenzene poisoning may be explained on the basis of disturbances in the cerebellum or the cerebellar paths.

"Toxic doses of nitrobenzene, when administered by vapor inhalation, exert a direct action on the Purkinje cells in the cerebellum, causing chromatolytic degeneration of these cells. Histological examinations have failed to reveal any definite changes in any of the organs of the body except the blood (presence of methemoglobin and morphological alterations of erythrocytes) and the cerebellum (chromatolytic degenerations of the Purkinje cells).

"The size of the lethal dose probably depends on conditions such as the amount and the kind of fats in the blood, which favor or disfavor a concentration of the drug in the vicinity of the nerve cells. The latent period (the time elapsing between the administration of the poison and the onset of the symptoms) is undoubtedly due to the absorption of the nitrobenzene from the blood, and its retention by the liquid fats of the body in which it is easily soluble. . . .

"Nitrobenzene can not be used, with any degree of safety, for the fumigation of animals to destroy their external parasites. . . . Because of the extreme toxic properties and the subtle action of nitrobenzene, the following uses of this drug should be prohibited by legislation: For perfuming soaps, lotions, and pomades; as a solvent in shoe polish, floor wax, and the like; and especially as an ingredient of flavoring extracts, confections, and liqueurs. The drug should be regarded as one of the most dangerous of poisons, and its sale and use should be regulated by law just as in the case of any other deadly poison."

A list of the literature cited consisting of 27 titles is included.

**Iodized chloroform in war surgery**, A. Chassevant (*Schweiz. Apoth. Ztg., 56 (1918), No. 44, pp. 581–583; abs. in Chem. Abs., 13 (1919), No. 7, p. 770*).—A solution of iodin in chloroform in the proportion of 1 gm. of iodin to 30 of chloroform has been used by the author with success as an antiseptic in the treatment of furunculosis, anthrax, suppurating wounds, and varicose ulcers. As a protective dressing for wounds an ointment made of equal parts of paraffin, white wax, and spermaceti is recommended.

**Acriflavin emulsion as a wound dressing**, T. E. A. Stowell (*Brit. Med. Jour., No. 3035 (1919), pp. 244, 245*).—The formula is given of an emulsified preparation of acriflavin developed by G. Humphreys, which is said to have given better results than the 1 in 1,000 solution in normal saline. The proportions to give a stable emulsion are as follows: Acriflavin 0.1, thymol 0.005, white wax 4, liquid paraffin 76, and distilled water 20 parts.

**Treatment of wounds by paraffin**, E. F. Pratt (*Brit. Med. Jour., No. 3035 (1919), pp. 243, 244*).—Several case reports are given of the successful treatment of burns and lacerated wounds with ambrin or paraffin. The method of procedure is first to clean the wound thoroughly with sterilized water and then spray or paint the melted paraffin over the affected area. A layer of gauze is then placed over the paraffin and another layer of melted paraffin sprayed or painted over the gauze. This is covered with a cotton pad and bandaged. The dressings should be changed daily, from 3 to 4 dressings being usually required.

The author refers to the "bipp" treatment of wounds (bismuth, iodoform, and paraffin), and suggests that the paraffin is the most important of the three ingredients.

**Extract of autolyzed yeast as a culture medium for B. coli**, F. Diénert and A. Guillerd (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 4, pp. 256, 257*).—The authors have found autolyzed yeast to be a satisfactory substitute for peptone in culture media. The composition is said to be much more constant than that of peptone and the cost much less.

**On a new accessory factor in bacterial infections.—Preliminary communication**, W. E. Bullock and W. Cramer (*Jour. Physiol., 52 (1919), No. 5, pp. XLV, XLVI*).—The authors state that suspensions of *Bacillus welchii* and of *Vibrion septique* do not produce gas gangrene or any symptoms of illness when injected into mice, rats, or guinea pigs, but that if a small quantity of a soluble ionizable calcium salt is injected, together with a suspension of these bacteria, a violent gas gangrene is produced which kills the animal within 20 hours. A similar phenomenon is observed with *B. tetani*, an animal injected with tetanus spores remaining perfectly well unless calcium chlorid is given. The chlorids of sodium, potassium, ammonium, strontium, and magnesium are not capable of releasing the pathogenic properties of *B. welchii*, and the action of the Ca ions can be antagonized by Na or Mg ions.

The conclusion is drawn that "calcium ions have the property of disturbing the relationship between the offensive mechanism of these bacteria and the defensive mechanism of the normal animal by which the bacteria are normally kept under control. The disturbance of this relationship leads eventually to a breaking down of this defensive mechanism. The term 'kataphylaxis' is proposed to designate this new phenomenon."

**The proteus group of organisms with special reference to agglutination and fermentation reactions and to classification**, I. A. Bengtson (*Jour. Infect. Diseases, 24 (1919), No. 5, pp. 428–481*).—This paper embodies the results obtained in a study of the cultural and agglutination properties of a number of organisms of the proteus group isolated from various sources. The char-

acteristics of the group as a whole and the differential characteristics of the various members have been determined by this study and by a review of the more important literature.

Food-poisoning epidemics in which the organism has been considered to bear a causal relationship are described in the literature. "Such epidemics are relatively few in comparison with similar epidemics ascribed to *Bacillus paratyphosus* B, and are not established on as firm a basis. As in the case of the latter organism the harmful effects produced may be due to the multiplication of the organism as well as to the formation of toxic substances, these toxins being very low in potency as contrasted with those produced by tetanus and diphtheria organisms.

"A number of local infections, including wound infections in which *Proteus vulgaris* have been concerned as the primary agent or as secondary agent, are described in the literature. Infections of the urinary tract due to this organism have been noted a number of times. Occasional general infections are also described."

An extensive bibliography is appended.

**A study of Abderhalden's polarimetric method**, A. SORDELLI (*An. Soc. Quím. Argentina, 6 (1918), No. 23, pp. 31–34*).—Polarimetric readings obtained in the examination by the Abderhalden method of samples of the placenta peptone and of sera from cases of cancer, tuberculosis, and typhus were found to be of the same order as those obtained with sera of pregnancy. As a result of this the conclusion is drawn that the Abderhalden method is lacking in specificity and its diagnostic value is to be doubted.

**Problems in anthrax control**, J. J. FREY (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 2, pp. 192–198*).—A brief discussion is given of the rôle of various agencies in the spread of anthrax, of the relative value of methods of immunization with emphasis on the superiority of the double-spore vaccine, and of the most suitable ways of sending specimens for laboratory diagnosis.

**Contribution to the question of specificity of the complement fixation method for diagnosing glanders**, FONTAINE and LÜTJE (*Ztschr. Veterinärk., 31 (1919), No. 1, pp. 1–36*).—An extensive investigation of the influence of various factors on the reliability of the complement fixation test for glanders is reported, from which the conclusion is drawn that the effect upon the test of other diseases is practically negligible. An explanation of occasional positive reactions in glanders-free animals is given, and the recommendation is made that the test be checked by the use of multiple aspecific extracts.

**Experiments on the detection of anaphylaxis in horses affected with glanders**, O. WALDMANN (*Arch. Wiss. u. Prakt. Tierheilk., 44 (1918), No. 3–4, pp. 253–289*).—The effects of intravenous injections of various preparations of glanders bacilli into 31 glandered and 11 glanders-free horses were studied for the purpose of determining whether the introduction of such antigens causes a state of anaphylaxis in glandered horses.

The sensitiveness produced was shown to be of the nature of the reaction produced in the mallein test rather than a phenomenon of anaphylaxis, as the reaction in sick and well horses differed only in degree and no subsequent state of antianaphylaxis was produced. The conclusion is drawn that the reaction can not be used with certainty for the purpose of diagnosing glanders.

**Habronemic conjunctivitis**, J. C. LEWIS and H. R. SEDDON (*Jour. Compar. Path. and Ther., 31 (1918), No. 2, pp. 87–94, figs. 2*).—Four cases are reported and discussed.

**The histology of the lesions of Johne's disease**, J. M'FADYEAN (*Jour. Compar. Path. and Ther., 31 (1918), No. 2, pp. 73–87, figs. 16*).—A report of a histopathological study.

**The spirochete of infectious jaundice (Spirochæta icterohæmorrhagiæ, Inada; Leptospira, Noguchi) in house rats in Chicago,** A. OTTERAAEN (*Jour. Infect. Diseases, 24 (1919), No. 5, pp. 485–488*).—"Spirochetes resembling those described as the cause of acute infectious jaundice were demonstrated in only two Chicago house rats of 30 examined (or 6.6 per cent), indicating that the spirochetes probably are not present in a high percentage of such rats. The spirochetes were demonstrated in material from the mouth and in tissue from the kidney.

"Because of the presence of spirochetes in the mouth of rats it is possible that at the time of the bite organisms may be carried into the wound by the saliva or teeth, and disease in this manner transferred directly from the rat to man."

**Scrapie,** J. M'FADYEAN (*Jour. Compar. Path. and Ther., 31 (1918), No. 2, pp. 102–131, figs. 2*).—The author here records experiments with scrapie which have been carried out at the Royal Veterinary College at London during the last seven years.

**Attenuation of human, bovine, and avain tubercle bacilli,** N. RAW (*Lancet [London], 1919, I, No. 10, pp. 376, 377*).—Pure cultures of human, bovine, and avian tubercle bacilli subjected for 12 years to continuous subculture on artificial media containing glycerin are said to have retained all their characteristic and selective appearances but to have undergone a gradual decrease in virulence, becoming almost nonpathogenic to animals. Reports are given of several cases of active glandular and pulmonary tuberculosis which have been apparently cured by injections of mixed attenuated bacilli, the cultures being raised to a temperature of 220° F. for two minutes before injection.

It is the opinion of the author that the careful use of such attenuated bacilli may have the effect of controlling and probably preventing tuberculous infections in the human body.

**Bovine tuberculosis in children,** R. S. AUSTIN (*Amer. Jour. Diseases Children, 17 (1919), No. 4, pp. 264–269*).—A study is reported of 24 cases of tuberculosis in children, ranging in age from 2½ months to 11 years, all but 3 cases of which ended fatally. Clinical, bacteriological, and post-mortem findings indicated that 7 of the cases were of bovine origin. The importance of this variety of the tubercle bacillus in tuberculosis of children and the necessity of home pasteurization of cow's milk are emphasized.

**A characteristic localization of Bacillus abortus in the bovine fetal membranes,** T. SMITH (*Jour. Expt. Med., 29 (1919), No. 5, pp. 451–456, pls. 3*).—The author reports a characteristic localization of *B. abortus* in the epithelial covering of the chorion, the cells of which in cases of infectious abortion have been found to be densely filled with minute bacilli. Fetal membranes at the end of the normal period of gestation which are macroscopically without pathological changes have been found uniformly free from such cell contents.

The author concludes that "the significance of this invasion of the chorionic epithelium from the standpoint of pathogenesis can not be properly evaluated until a more complete history of the successive localizations of *B. abortus* has been obtained. It is safe to assume that this particular cell parasitism is but one of a series of localizations and centers of multiplication in the fetal membranes, although evidence points to it as perhaps the earliest stage in which the organism gains by rapid, unchecked multiplication a considerable advantage over the host. The local destruction of an epithelial covering by an infectious agent when other miscellaneous infectious agents are absent may or may not be of much importance, for it would depend on the regenerative activity of the epithelium, the tendency to the gathering of injurious transudates, and the toxic substances associated with the bacilli."

**Report of committee on bovine diseases.—Their relation to the milk supply and to the public health,** C. L. ROADHOUSE (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 7 (1918), pp. 49–53*).—A carefully kept record of the cause of losses of animals in two large certified herds is presented.

**A new disease of bovines and ovines,** P. DE FIGUEIREDO PARREIRAS HORTA (*Rev. Vct. e Zootech., 8 (1918), No. 2, pp. 3–32*).—This discussion relates to a gastroenteritis hemorrhagica found in cattle and sheep in the States of Minas-Geraes and Rio de Janeiro, Brazil.

**Sheep-maggot flies, IV,** W. W. and J. L. FROGGATT (*Dept. Agr. N. S. Wales, Farmers' Bul. 122 (1918), pp. 24, figs. 11*).—This is a report, in continuation of that previously noted (E. S. R., 38, p. 466), of work carried on during 1917–1918 at the government sheep-fly experiment station, at Kooroogama, Moree.

**Are camels susceptible to blackquarter, hemorrhagic septicemia, and rinderpest?** H. E. CROSS (*Agr. Research Inst. Pusa Bul. 80 (1918), pp. 17, pl. 1, fig. 16*).—The conclusions drawn from the investigations are that camels are as susceptible to blackquarter as cattle, that they are not very susceptible to hemorrhagic septicemia, and that they develop severe lesions of rinderpest, and are more susceptible to the disease than some cattle.

**Paralysis in the hind quarters of a sow due to kidney worms,** E. M. PICKENS and C. C. SHIVERS (*Cornell Vet., 9 (1919), No. 2, pp. 124–126*).—The authors record a case of paralysis in a grade 6-year-old sow, reared at the Maryland Experiment Station, which was caused by *Stephanurus dentatus*.

**Observations in regard to immunizing young pigs,** R. R. BIRCH (*Cornell Vet., 9 (1919), No. 2, pp. 75–92, figs. 15*).—The author discusses the problem of establishing immunity to hog cholera in young pigs by the use of the simultaneous treatment following serum alone, and reports investigations conducted upon young pigs to determine whether passive immunity produced by serum alone interferes with the production of active lasting immunity by the simultaneous treatment, and what influence is exerted by the interval beween the two treatments. The general plan was to give follow-up treatment to several groups of pigs, litter mates of known susceptibility, at various ages and with various intervals elapsing between serum-alone and simultaneous treatment. Other groups were given simultaneous treatment only and were used as checks. In the experiments reported none of the pigs showed any physical reaction, all acquired a lasting immunity, and individual differences in temperature reaction were not such as to indicate that the passive immunity produced by serum alone prevents the establishment of active immunity by subsequent simultaneous treatment. This principle appeared to hold good regardless of the interval elapsing between the two treatments.

The observation is made that there is apparently a distinct difference between natal immunity and serum-alone immunity in young pigs, in that if virus and serum are given while natal immunity still persists active immunity is not conferred; but virus and serum administered during the existence of passive immunity due to serum alone usually produces active immunity.

In conclusion the author recommends that in garbage-fed herds, and in other herds where there is constant danger of infection, serum alone should be administered when the pigs are from 4 to 6 weeks of age, or earlier if hog cholera should develop. This should be followed by simultaneous treatment when the pigs are from 9 to 12 weeks of age. If it is necessary to administer serum when the pigs are 2 or 3 weeks of age, a second dose of serum should be given 4 weeks later, followed in the usual manner and length of time by the simultaneous treatment. In immunizing herds less seriously threatened, the first serum-alone treatment may be omitted entirely.

**So-called medicinal hog-cholera remedies and cures**, C. H. CLINK and D. B. CLARK (*Indiana Sta. Bul. 223 (1918), pp. 3–24, figs. 2*).—It is stated that the great loss of hogs resulting from outbreaks of hog cholera makes it important that the farmers of the State should appreciate the fact that the so-called medicinal hog-cholera remedies and cures have not been successful in controlling the disease in herds under test. In compliance with the provisions of the swine-disease law 20 different preparations have been tested and are here reported upon. Of 235 treated hogs 187 died of cholera and of 227 untreated hogs 179 died, thus showing that the preparations did not control the disease.

**Necrobacillosis**, C. P. FITCH (*Cornell Vet., 9 (1919), No. 2, pp. 93–103*).—A contribution from the Minnesota Experiment Station in which the author draws the following conclusions:

"Necrobacillosis of swine is becoming more prevalent in certain sections of the country and is assuming considerable economic importance. It is in no sense a new disease. The five principal forms of this infection as occurring among swine are necrotic stomatitis, necrotic rhinitis, necrotic gastritis and enteritis, necrotic dermatitis, and necrotic pneumonia.

"Oftentimes necrobacillosis and hog cholera occur in the same animal. These cases of mixed infection require great care in making a correct diagnosis. If the necrotic lesions are not too extensive or the herd too widely involved it may be wise to use antihog cholera serum. Some types of necrobacillosis lend themselves to treatment, but the keynote in the control of this disease is prevention, based especially on the proper disposal of the manure."

A list of ten references to the literature is included.

**Atlas of the anatomy and physiology of the horse**, O. C. BRADLEY and T. G. BROWNE (*London: Baillière, Tindall & Cox, 1918, pp. 38, pls. 13*).—Of the 13 original plates containing 105 figures, by G. Dupuy, 5 are in color.

**The normal blood of the horse**, H. BONARD (*Schweiz. Arch. Tierheilk., 61 (1919), Nos. 3, pp. 113–137, figs. 3; 4, pp. 160–174*).—This reports upon the specific gravity of the blood of the horse and its hemoglobin content as measured by Sahli's hemometer.

**Castor seed (Ricinus communis) poisoning in horses**, G. H. WOOLDRIDGE (*Jour. Compar. Path. and Ther., 31 (1918), No. 2, pp. 94–98*).—A report upon the poisoning of horses from having fed upon a mixed feed which contained castor seed. Five of the affected animals died and the services of others were lost for several weeks.

**Poisoning of horses with castor seeds**, M. E. WHITE (*Jour. Compar. Path. and Ther., 31 (1918), No. 2, pp. 98–100*).—A report of poisoning in several horses that had fed on castor beans.

**Strongylidæ in horses**, W. YORKE and J. W. S. MACFIE (*Ann. Trop. Med. and Par., 12 (1919), No. 3–4, pp. 273–278, figs. 9*).—In continuation of previous papers (E. S. R., 39, p. 892) the authors describe a sixth new species to which the name *Cylicostomum pseudo-catinatum* is given.

**Preliminary report on ulcerative lymphangitis in horses of the A. E. F.**, A. H. STRAUS and A. C. WIGHT (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 2, pp. 180–186*).—A bacteriological study is reported of 36 cases diagnosed as ulcerative lymphangitis. The streptococcus was found to be the most frequent cause of the disease, being isolated in almost pure culture from 22 of the cases. The cryptococcus was found in 5 cases, the bacillus of Preisz and Nocard in 4, and *Staphylococcus aureus* in 1. Four cases proved to be glanders, a fact which shows the importance in making the diagnosis of first excluding glanders by use of the mallein and complement fixation tests.

In the treatment of cases of streptococcic and staphylococcic infection, the method employed has been the routine local treatment followed by the use of an autogenous vaccine or a stock vaccine containing from 4 to 10 strains of streptococci. The latter vaccine was prepared by growing the streptococci in dextrose bouillon for 24 hours, killing by heat, and diluting with physiological salt solution to approximately one billion per cubic centimeter. This was preserved in a 0.5 per cent solution of carbolic acid and injected daily in increasing doses from 1.5 billion to 4 billion organisms on the seventh day. This method of treatment has proved successful in the cases studied.

**Investigations concerning the prevalence and distribution of poultry diseases in New Jersey**, H. R. LEWIS (*New Jersey Stas. Rpt. 1917, pp. 175–177*).—Of 140 diseased fowls sent to the poultry department from various parts of the State during the year, 58 were suffering from diseases of the reproductive system. Several that had never laid an egg were found to be suffering from miscarriage and reabsorption of the ova, and it is suggested that this may be one of the causes in some pedigree laying flocks for the low production by some individuals which have every external appearance of high production.

**Experiments on the intradermal test for Bacterium pullorum**, M. SCHERAGO and J. P. BENSON (*Cornell Vet., 9 (1919), No. 2, pp. 111–119*).—A comparative study is reported of the agglutination test for the presence of *B. pullorum* infection in fowls and the intradermal test proposed by Ward and Gallagher (E. S. R., 36, p. 884). Both tests were used on 134 fowls, and the most typical reactors to either or both tests were used in retests to check the results obtained at first and to observe the influence of previous injections with the intradermal test fluid on subsequent agglutination and intradermal tests.

From results which are summarized in tabular form, the authors conclude that the intradermal test is so inconsistent as to be worthless as a diagnostic agent for *B. pullorum* infection in adult fowls. As possible reasons for the inconsistency of the test, it is suggested that edema is likely to develop and persist for some time after injection even with the introduction of sterile water, the introduction of any foreign protein is likely to give the same results, and hematomes are very apt to develop after injection and interfere with the reading.

The experiments also indicated that a previous injection of the intradermal fluid caused at least 85 per cent of the birds retested to react to the agglutination test, regardless of their reaction in the original test.

**Gapes in chickens**, H. ATWOOD and C. A. LUEDER (*West Virginia Sta. Circ. 30 (1919), pp. 4*).—A brief summary of information on this affection, means for its prevention, and remedial measures. An outbreak of the affection at the station farm in 1900 and 1901 was eradicated through the practice of burning all chickens that died of the disease, and keeping the young chickens shut up until after the dew had dried off in the morning.

In a study made of recently hatched gape worms the junior author found them to be extremely susceptible to a very dilute solution of creolin or carbolic acid. A solution of 3 drops of creolin in a pint of water killed the newly hatched worms in from 30 to 60 seconds. This led to the conclusion that creolin added to the drinking water would serve as a remedy, since the medicated water would necessarily flush the surfaces to which the worms had just become attached and so kill them, and experiments were conducted that proved the correctness of this hypothesis.

**Tuberculosis in farm poultry**, W. W. DIMOCK and L. E. WILLEY (*Iowa Sta. Circ. 56 (1919), pp. 3–12, figs. 6*).—A popular summary of information relative to tuberculosis in fowls.

It is pointed out that the disease is somewhat prevalent here and there among poultry flocks in the State of Iowa. Of 255 fowls examined at the pathological laboratory of the Iowa State College from July 1, 1912, to September 11, 1915, tuberculosis was the cause of sickness or death in 43. Of 227 fowls similarly examined between September 11, 1915, and June 1, 1918, 83 were affected with tuberculosis.

## RURAL ENGINEERING.

**Softening hard water with permutit,** R. HULBERT (*North Dakota Sta. Spec. Bul., 5 (1919), No. 9, pp. 193–208, figs. 3*).—Continuing the series previously noted (E. S. R., 40, p. 588) tests of a small-sized permutit water softener on water from the city supply of Fargo, N. Dak., are reported.

"The plant consists of a hollow steel cylindrical shell, 9 in. in diameter by 5 ft. in height. The cylinder is closed at the top with removable, water-tight head, to operate under pressure. For these tests the softener was charged with 40 lbs. of new permutit mineral, resting on a 5-in. layer of coarse gravel. This charge is supported on a perforated steel plate some 6 in. above the bottom of the tank. Above the bed of permutit is placed an upper screen-plate holding a 5-in. layer of coarse, screened, washed marble, the purpose of which is to remove carbon dioxid from the raw water before it passes through the permutit. Supported on brackets at the right and on a level with the top of the cylinder is the brine tank holding about 10 gal., in which is prepared the salt solution for regenerating the permutit. A water meter is placed in the hard water intake pipe for controlling the rate of softening and backwashing, and to indicate the total volume of water passed through the plant in either of these operations. . . .

"The zero water capacity of the permutit softener operated in these tests was five times its rated capacity, as stated by the manufacturers. This very considerable underrating, if carried out in commercial practice, should guaranty that this type of softener would always furnish at least its rated capacity of completely softened water even under adverse operating conditions, which in practice might result from (1) abnormal increases in the hardness of the raw water, (2) incomplete regeneration, (3) allowing the softener to exceed its specified maximum rate, or to exceed its rated capacity between regenerations through careless operation, and (4) any possible depreciation in the quantity of zeolite over a number of years.

"The permutit content of the softener is only about one-third completely exhausted when the filter has delivered its full capacity of zero water. Remembering that its full capacity in these tests was five times more than its rated capacity, it follows that in normal operation the zeolite is only slightly exhausted between regenerations. Permutit may be fully regenerated even from complete exhaustion. This requires, however, a disproportionately large volume of brine with a much higher concentration of salt, and a longer period of time than is feasible under practical operating conditions. A permutit installation will easily furnish double its rated capacity of zero water when operated intermittently, and without exhausting the zeolite beyond the point where it may be restored by a normal regeneration.

"Under any operating conditions the cost of salt for regeneration will not exceed 0.7 ct. per thousand gallons of soft water for each grain per gallon of hardness removed. Fargo city water can be softened completely by permutit at a total cost not exceeding 20 cts. per thousand gallons. This estimate includes all fixed and operating charges. The soap consuming power of Fargo

tap water averages 12 lbs. per thousand gallons. This is equivalent to a money waste of about $2.50 at the present price of soap."

Coal stove brooder and colony brooder house, W. F. SCHOPPE (*Montana Sta. Circ. 80 (1918), pp. 33–46, figs. 7*).—This circular describes the construction and operation of the coal stove brooder and colony brooder house under Montana conditions.

"The principal advantage of the coal stove brooder is that a large number of chicks can be handled in one flock under one hover. . . .

"Experience for the past two years indicates that the heat can be better controlled with these coal brooders than with oil lamps. The source of heat is larger and consequently more uniform. The greatest difficulty arises from allowing the ashes to clog the fire-bed or to accumulate in the ash pit so as to cover the drafts and kill the fire. To overcome this the fire should be shaken down twice each day and the ashes removed. The temperature under the hover should vary with the age of the chicks. The brood should be started at about 110° F., gradually dropping this about 10° each week for the first four weeks. . . .

"Although the coal-stove brooders are constructed for the use of hard coal, soft coal can be used with equally satisfactory results, provided a little more care and attention are given the fire. Fine coal and very large lumps are to be avoided. . . . On an average about 20 lbs. of soft coal a day will run the brooder during mild weather; in extremely cold weather it requires at least 30 lbs. of soft coal to operate for the 24 hours."

## RURAL ECONOMICS.

War prices and farm profits, H. C. TAYLOR and S. W. MENDUM (*Wisconsin Sta. Bul. 300 (1919), pp. 18, figs. 10; Hoard's Dairyman, 57 (1919), No. 21, pp. 1052, 1053, figs. 6*).—The discussion is based on records of 60 farms in Verona Township, Dane County, Wis., for the period of 1913–1917. This community is fairly typical of southern Wisconsin. Corn, oats, and hay are the staple crops, and dairy products, cattle, and hogs are the main sources of income.

In 1914 and 1915 the gross receipts and farm profits fell below the level of 1913. Farm receipts increased appreciably in 1916 and even more in 1917. "In both of these years the expenses increased, but not so rapidly as the income; hence, there was an increasing proportion of the gross income left for the farmers' profits or labor income."

It is shown that "the higher profits of 1916 were due in part to better crops but more largely to higher prices, and that the relatively high returns in 1917 must be attributed entirely to high prices, because the crops were poorer. . . . Even with such high prices as those of 1916 and 1917 the average labor income for the five years stands at $408. . . .

"On the average for the five years one out of every six farmers netted a loss ranging from $20 to $598, omitting what the family received from the farm. . . . Yet . . . more than half the farmers made labor incomes which, when combined with what the farm furnished the family, put them in a position to get ahead financially year after year. The future of American agriculture demands that the road be kept open to the top. . . . Prices should be high enough to give at least five out of six a labor income."

The study is graphically illustrated, and tables are given showing a summary of the farm business over a period of five years, 1913–1917, and labor incomes arranged according to size of the 5-year average.

**The cost of producing Minnesota field crops, 1913–1917**, F. W. PECK (*Minnesota Sta. Bul. 179 (1918), pp. 42, figs. 4*).—This study follows the plan of one previously noted (E. S. R., 32, p. 688).

Among the principal results noted are that the average monthly cost of board for the period 1913–1917 at Halstad amounted to $14.96 and at Cokato to $16.02. The average wage rate per hour for labor hired by the month for 1913–1917 for the seven crop months (April to October) was 15.3 cts. at Halstad and 15.7 cts. at Cokato. This was an increase of 12 per cent over the previous 5-year period. The cost of labor was 21 per cent higher in 1917 than in 1912.

The 5-year average annual cost of maintaining a farm work horse at Halstad was $110.50 and at Cokato $113.36. In 1917 the cost was $151.56 at Halstad and $128 at Cokato. The average cost per hour was slightly more than 11 cts. in each locality. In 1917 the rate per hour was 17 cts. at Halstad and 13.6 cts. at Cokato. For the period 1913–1917 the average annual depreciation of machinery was 7.3 per cent for all machines.

By comparing the cost per acre for the 5-year period 1908–1912 with the cost during 1913–1917, it was found that there was an increase in cost of the principal crops, as follows: Wheat 40 per cent, oats 28, barley 31, corn 25, silage 16, tame hay 49, wild hay 19, and clover seed 15.

The report contains a number of statistical tables showing complete details.

**Live stock and other factors for profitable farming in northern Kentucky**, J. B. HUTSON (*Kentucky Sta. Circ. 21 (1918), pp. 6–20*).—Conclusions arrived at from a farm management study of 80 representative farms in Kenton County, Ky., in the summer of 1917, are set forth here. The average farmer's earnings for the 80 farms was $871, and for the most profitable 10 farms, $1,866. Comparisons are made between the averages for the 80 farms and for the most profitable 10 farms, in actual values and on a percentage basis, in matters of amount of live stock kept, production per cow (in pounds of milk), crop yields, and size of business.

Studies are also made of the relation of the above factors to the farmer's earnings, and it is shown that the quality and quantity of live stock kept and the size of the business very materially affect the income.

**Report of the State Land Settlement Board of the State of California**, E. MEAD ET AL. (*Rpt. State Land Settlement Bd. Cal., 1918, pp. 30, pls. 2*).—The commission appointed to administer the State land settlement act makes its first report of operations and expenditures.

**Suggestions to the settler in California**, T. F. HUNT ET AL. (*California Sta. Circ. 210 (1919), pp. 80, figs. 9*).—This circular contains statistics of the average, probable, and possible yields of important California crops, also general information regarding capital, land settlement, selection, and organization of farms, need of water, soil characteristics, marketing advantages, climate, and other features. It is similar to one previously noted (E. S. R., 32, p. 193).

Brief articles by specialists on the staff of the College of Agriculture on the production of certain typical crops and of meat, dairy products, poultry, and bees are included.

**Experiences of northern Minnesota settlers**, F. W. PECK (*Minnesota Sta. Bul. 180 (1918), pp. 43, figs. 10*).—This bulletin is based on information gained by forest rangers from testimony of personal experience of settlers in northern Minnesota. One hundred forty-one records were taken and tabulated under the direction of the division of agronomy and farm management. The crop seasons reported on are those for 1914, 1915, 1916, and a few for 1917.

Part 1 includes a tabulation of detailed information, by counties, and number of farms surveyed, of township and range areas covered in each county, general

facts concerning settling on the land, cash required, crop statistics, live-stock statistics, total receipts per farm and distribution of income, and principal complaints of settlers. Part 2 contains maps of each county concerned and presents the records of individual farms that make up the averages presented in Part 1.

Some of the conclusions are that a soil survey and land utilization survey should be made, that small grain crops, potatoes, garden produce, and hay may be made profitable crops in this section, that a constructive program of State aid in clearing the land and draining it is necessary and would eliminate the settler's need of working away from his farm, that live stock, especially dairy stock, is a prime essential to a good income, and that it is desirable to develop the woods as an annual cash crop. Furthermore, real estate licenses under safe regulations should be adopted, and investigations as to cost and methods of clearing land, profitable marketing practices, types of farming, land colonization schemes, and like problems should become a part of the State's program of land reclamation and settlement.

**First steps for bringing into use the idle lands of Oregon.** T. T. Munger (*Commonwealth Rev., Univ. Oreg., 3 (1918), No. 3, pp. 52–62*).—In this article the author urges careful classification of the cut-over lands and rough, hilly lands of Oregon as the first step in inducing colonization in that State.

**[Agricultural phases of political economy].** T. N. Carver (In *Principles of Political Economy. Boston and London: Ginn & Co., 1919, pp. 142–154, 208–229, 318–328, 409–417, 563–571, fig. 1*).—The author includes in this examination of economic principles chapters on land, the genetic industries, marketing, the rent of land, and the single tax.

**Scientific agriculture and the nation's food.** [H. G. Wells] (In *The Elements of Reconstruction. London: Nisbet & Co., Ltd., 1916, pp. 45–56*).—The author's point of view is that the State should function as a buyer and distributor of food, that a tariff must not be merely protective but subsidize the grower in the form of a bonus price at the expense of the community benefiting from a prosperous agriculture, and that nationalization of public services will spread and make effectual the scientific education.

**Conservation and regulation in the United States during the world war.** C. R. Van Hise (*Washington: U. S. Food Admin. [pt. 1] (1917), pp. 63; pt. 2 (1918), pp. VII+64–283*).—Part 1 consists of an outline for a course of lectures to be given in higher educational institutions on the economic principles involved in conservation and Government regulation, the conditions antecedent to the world war, economic effects of the world war, measures taken for fruit production and conservation, and Federal regulatory legislation. Part 2 describes in detail the work accomplished under the various laws and boards. The outline was prepared for the U. S. Food Administration.

**The food crisis and Americanism.** W. Stull (*New York: The Macmillan Co., 1919, pp. VIII+135*).—The author discusses the increase of farm mortgages, also school systems, organized labor, mills and elevators, methods of packers, and many others as factors in the food shortage and low farm profits.

**The farmer's problem and the remedy.** E. F. Ladd (*North Dakota Sta. Spec. Bul., 5 (1919), No. 8, pp. 177–190*).—In this address before the Tri-State Grain Growers' Convention at Fargo, N. Dak., January 16, 1919, the author emphasizes the farmer's responsibility in matters of improved methods of production, grading, and marketing of products, also of cooperation and diversified agriculture for North Dakota.

**The place of agriculture in industry.** C. S. Orwin (In *Some Problems of Urban and Rural Industry. Oxford: Ruskin Col., 1917, pp. 60–75*).—This paper is a part of the report on The Reorganization of Industry, Series II. The

points enlarged upon by the author are, first, that the nation, as a whole, must consider questions relating to the increase of home-grown food supply, and second, that a complete reorganization of the industry itself is necessary. He favors industrialization for large-scale production.

The position of the rural worker in industry, A. W. Ashby (In *Some Problems of Urban and Rural Industry. Oxford: Ruskin Col., 1917, pp. 76-97*).—This paper appears in the series noted above. The author says here that the agricultural worker must be assured an adequate income and some leisure time. He discusses the disadvantages of small holdings, the rate of wages, competition of unskilled labor, housing, and related topics.

How the laborer lives: A study of the rural labor problem, B. S. Rowntree and M. Kendall (*London and New York: Thomas Nelson & Sons, Ltd., 1917, pp. 342, pl. 1*).—This book, first published in 1913, showing that the agricultural wages then paid were below the efficiency minimum, is republished with the aim of showing that correspondingly the wage of 25s. ($6.08) provided under the Corn Production Act of 1917 must prove inadequate. It contains a chapter on wages based on figures found in volume 5 of the Report on Earnings and Hours of Labor in 1907. In addition, it gives accounts of investigations and figures obtained by cross-questioning housewives in 42 rural families in counties of England and Wales regarding their household budgets, covering weekly money earnings, extra earnings, charitable gifts, rent, percentage of standard requirements of food consumed, etc.

The economic future of agriculture, V. A. Malcolmson (*Jour. Farmers' Club [London], 1919, Apr., pp. 39–57*).—A sliding scale of duties imposed on imported wheat and flour is advocated in this paper. It is suggested that import duties should begin to operate at the level of 60s. ($14.60) a quarter, and that principles of empire preference be incorporated in the policy of taxation in the form of a 50 per cent rebate on importations from empire sources. There are included cost of production data in the form of several typical balance sheets giving the approximate cost of wheat per acre in 1913–14, and in 1917–18, also family budgets from the study noted above illustrating the cost of living of the agricultural laborer.

Farm tenancy and leases, A. H. Benton (*Minnesota Sta. Bul. 178 (1918), pp. 33, figs. 2*).—In this are discussed questions of the increase in farm tenancy in the United States and particularly in Minnesota, and of types of farm leases, namely, the one-third crop share lease, the one-half crop share lease, the crop and stock share lease, the one-third crop and stock share lease, and the cash lease. Suggested forms for several of these leases are given.

It is indicated here that data collected by the division of agronomy and farm management of the University of Minnesota, including that from a farm management survey previously noted (E. S. R., 39, p. 394), show that the advantages, both to the landlord and tenant, under the share lease system, are greater than under either the cash or mixed share and cash system.

Several tables are given to show the shares that landlord and tenant should bear in the cost of production of wheat, oats, barley, hay, and corn, and the cost of maintaining a dairy cow, and to indicate the landlord's and the tenant's expense under the one-half share system and the one-third share system. These tables are based upon recent data of the cost accounting section and results of investigations previously noted (E. S. R., 32, p. 688; 35, p. 691).

The function of the farm bureau, B. H. Crocheron (*California Sta. Circ. 209 (1919), pp. 16*).—The speaker addresses the annual farm bureau conference on the beginning of the farm bureau organization in California, its functions, and its relationships with the farm advisor, members of the community, the

U. S. Department of Agriculture, the agricultural college, and the experiment station.

**The Federal Farm Loan System**, G. E. PUTNAM (*Amer. Econ. Rev., 9 (1919), No. 1, pp. 57–78*).—In this article there are reviewed the establishment of the system, difficulties that required adjustment before any loans were made, difficulties encountered in matters of making loans, especially in the war crisis, and the position of joint stock land banks and proposed amendments pertaining to them. The author suggests that part of the system will need readjustment before American needs can be adequately met.

**The Jewish Agricultural and Industrial Aid Society annual report for the year 1918** (*Jewish Agr. and Indus. Aid Soc. Ann. Rpt. 1918, pp. 49*).—This report continues information previously noted (E. S. R., 39, p. 89).

**Remarks upon the function of agricultural cooperative associations in Egypt**, S. B. HENEIN (*L'Egypte Contemporaine, 10 (1919), No. 45, pp. 297–323*).—This paper reports on cooperative associations operating in provinces of Egypt, describes their legal status, criticises them, and offers suggestions for their closer organization.

**Reports on the working of the cooperative societies in the Punjab for the years ending July, 1916, 1917, and 1918** (*Rpt. Work Coop. Soc. Punjab, 1916, pp. 9+14; 1917, pp. 10+19; 1918, pp. 12+15*).—These reports continue the information previously noted (E. S. R., 34, p. 894).

**Farmers' Market Bulletin** (*North Carolina Sta., Farmers' Market Bul., 6 (1919), No. 26, pp. 7*).—In addition to the usual partial list of products which farmers have for sale, this number contains articles on the soy bean market and the demand for North Carolina corn.

**Our sister Italy: Her agricultural production and her trade with France**, B. RAMBAUD (*Ann. Ecole Nat. Agr. Grignon, 6 (1915–16), pp. 75–138, figs. 8*).—Part 1 of this article discusses the changes in Italian agriculture during the past 50 years, and contains comparative data on the production of the principal crops, together with a forecast with reference to the future of Italian agriculture. Part 2 covers the trade between France and Italy for a series of years, showing the principal products of exchange and comparing French and German methods in competing for Italian markets.

**Agricultural statistics of Denmark** (*Statis. Aarbog Danmark, 23 (1918), pp. XXIV+264+[4]*).—This number continues the information previously noted (E. S. R., 39, p. 91), and adds statistics relating to land values taken in 1916 to serve as a basis for rental.

**Annual report on reforms and progress in Chosen (Korea), 1916–17** (*Ann. Rpt. Reforms and Prog. Chosen (Korea), 1916–17, pp. XIII+188, pls. 16*).—This report adds later information to that previously noted (E. S. R., 39, p. 192).

## AGRICULTURAL EDUCATION.

**Report of the development commissioners on their proceedings during the year ended March 31, 1918**, R. F. CAVENDISH ET AL (*Rpt. Develop. Comrs. [Gt. Brit.], 8 (1918), pp. [2]+16*).—This is a report of the procedures of the development commissioners of Great Britain for the year 1917–18, which were in continuation of the policy adopted since the beginning of the war, as noted in the previous report (E. S. R., 38, p. 794). The total of recommended expenditures during the year for agriculture, rural industries, and forestry was $876,948, including loans amounting to $24,908. The sum total of advances recommended for these purposes up to March 31, 1918, was $9,993,900, including loans amounting to $1,394,995.

**War work of women in colleges, I–II** (*Washington: Committee Pub. Inform. [U. S.], 1918, [pts. 1], pp. 11; 2, pp. 21*).—The first of these publications gives a description of how the colleges for women met the war emergency, college war courses, student war activities, and the employment of college-trained women. The second contains supplementary information. It is not intended to be a "complete survey of the college war work of the country, but is a reportorial account of news which has been sent to The Division on Woman's War Work of the Committee on Public Information."

**Report of the division of extension in agriculture and home economics,** A. AGEE ET AL. (*New Jersey Stas. Rpt. 1917, pp. 211–309; N. J. Agr. Col. Ext. Bul., 1 (1917), No. 13, pp. 94*).—This is a report on the organization and progress of the extension activities in New Jersey for 1917, including farm and home demonstration work and boys' and girls' club work. Attention is called to the reorganization of the county boards of agriculture on a community basis, according to the plan originated last year, and their assumption of all local responsibility for farm demonstration work. A suggested constitution and program of work for county boards of agriculture are included.

The essential features of a cooperative plan adopted in the boys' and girls' club work between the State department of public instruction and the extension division of the agricultural college are outlined. It is provided that the extension division is to direct and supervise all project work from the agricultural and home economics point of view, and the department of public instruction is to have within its jurisdiction everything that pertains to the place that club work shall have in the schools. All projects are to be outlined by the extension division in cooperation with the county farm demonstrator and the county superintendent of schools.

**Wisconsin wins: Annual report of the agricultural extension service for 1917–18,** H. L. RUSSELL and K. L. HATCH (*Wisconsin Sta. Bul. 301 (1919), pp. 24, figs. 19*).—This is a brief report on the activities of the extension service in the 1917–18 food production campaign to achieve the production of more of the essential vegetable foods, an increase of the supply of fats and animal foods, a greater production of feed for animals and of food for man, and the bringing of more acres under cultivation through drainage, land clearing, and control of weeds, plant diseases, and insect pests.

**Agricultural training for returned soldiers: Preparatory and field instruction,** W. J. BLACK (*Agr. Gaz. Canada, 5 (1918), No. 12, pp. 1123–1126*).—An outline is given of a course of instruction, adopted by the Soldier Settlement Board of Canada, to enable men without experience who desire to farm to secure at least a general working knowledge of farming operations on training farms in Great Britain in the interval between the signing of peace and the return of the men to Canada.

**Outline studies on the school garden, home garden, and vegetable growing projects,** O. J. KERN (*California Sta. [Pub.], 1919, pp. 64, figs. 32*).—This is a reprint of part of the syllabi the author has worked out in his course for teachers on the elements of agricultural nature study and school and home gardening in the University of California.

**Agricultural laboratory exercises and home projects adapted to secondary schools,** H. J. WATERS and J. D. ELLIFF (*Boston: Ginn & Co., 1919, pp. VI+218, figs. 160*).—This manual contains outlines of 96 laboratory exercises dealing with plant life and growth, the soil and its management, field and orchard crops, insects and plant diseases and their control, breeds and types of farm animals, feeding farm animals, and farm equipment and machinery, together with outlines of five production projects and two soil, demonstration, and

improvement projects, respectively. The authors have endeavored to make the exercises and projects "cover as completely as is possible the important, interesting, and practical farm problems of the country. . . . Each exercise and home project has been tried out." Tables showing digestible nutrients and fertilizing constitutents in common American foodstuffs, plant food contained in common fertilizers, feeding standards, and a suggested list of typical home projects are appended.

**Manual for the teaching of agriculture, home economics, and manual training in the sixth grade**, T. E. BROWNE (*State Bd. Ed. [N. C.], Agr. Bul. 1 (1918), pp. 42, figs. 5*).—Instructions are given for carrying out projects in Irish potato growing, poultry raising, tomato growing, and gardening, one of which the pupil is to select as his laboratory work. Of the possible 100 points, a weight of 70 is given to the production phase, and 30 points to each to the manual training and domestic science or cooking phase. This makes it possible for the boy to meet his 100 points by completing the production and manual training phases and for the girl by completing the production and cooking phases. A weight of 60 for the textbook work and 40 for the project is considered a fair distribution.

**Manual for the teaching of agriculture, home economics, and manual training in the seventh grade**, T. E. BROWNE (*State Bd. Ed. [N. C.], Agr. Bul. 2 (1918), pp. 30, figs. 4*).—This is the second of a series of bulletins to be issued in accordance with the requirements of the law of 1917. It gives directions for carrying out manual training, growing and cooking projects with corn, peanuts, and vegetables, and raising a pig.

**Soils and crops**, J. G. MOSIER (*Chicago: Rand, McNally & Co., 1919, pp. VIII+412, figs. 179*).—This text for schools includes a study of the factors of crop production and of the following crops, together with some of the underlying principles and practices involved in their improvement: Cereals, legumes, forage, fiber, tuber, root, and sugar crops, and broom corn, rape, and field beans. A study outline and problems, practice work, and references for supplementary reading follow each chapter. Tables giving the legal weights of seed per bushel and plant food requirements for crops are appended.

**Botany for agricultural students**, J. N. MARTIN (*New York: John Wiley & Sons, 1919, pp. X+585, figs. 488*).—This book is intended for elementary courses in botany, covering a year's work, in colleges and universities.

In its preparation the aim has been to present the fundamental principles of botany, with emphasis upon their practical application. The author holds that in an elementary course in botany, regardless of the education the student desires to obtain, the guiding aim of both recitation and laboratory work should be to give the student a notion of the fundamental principles of botany. A secondary aim should be to relate the subject to the student's major line of work.

The subject matter in this text consists of two parts, part 1 being devoted to the study of structures and functions, chiefly of flowering plants, relating them to such agricultural subjects as farm crops, forestry, and horticulture and to the more advanced courses in botany. Part 2 consists of a study of the kinds of plants, with emphasis upon their evolutionary relationships and their economic importance, and evolution, heredity, and plant breeding as related to the improvement of plants.

**Farm horticulture**, G. W. HOOD (*New York: Lea & Febiger, 1919, pp. VI+339, figs. 142*).—This book has been written primarily as an elementary text to meet the needs of the undergraduate collegiate students as well as those who are studying agriculture in the secondary agricultural schools. It

should also serve as a guide to the farmer and city man practicing horticulture about the home, as it treats the subject from the standpoint of production of horticultural products as well as improvements for the home. The following subjects are dealt with: Planning the home garden, the seed, hotbed and cold frame, cultivation and tillage, plant propagation, budding, grafting, and pruning, plant pests, spray machinery and materials, harvesting and marketing, the winter protection of plants, the strawberry, bush fruits, the brambles, the grape, pome fruits, stone fruits, citrus fruits, and beautifying the home grounds. Lists of shrubs which can be used as guides for the various geographical regions in this country are appended.

**Productive sheep husbandry**, W. C. COFFEY (*Philadelphia and London: J. B. Lippincott Co., 1918, pp. X+479, pl. 1, figs. 262*).—This manual of sheep husbandry comprises seven parts dealing respectively with the history of sheep raising and breeding, structure and judging, breeds, the management of the flock, sheep feeding, sheep management on the ranges in the Western States and buildings and equipment for farm flocks, and preparing mutton on the farm.

**Vocational agriculture in high schools. Animal husbandry series No. 1: Some suggestions as to the subject of dairy husbandry**, T. H. EATON (*State Bd. Ed. Conn. Bul. 19 [1919], pp. 28*).—This bulletin deals with the content, organization, and method of instruction in dairying in the high schools in Connecticut. The suggestions are designed for a treatment of dairy husbandry to make use of at least one-half of the total time given to the agricultural course for the year.

**Trees, stars, and birds: A book of outdoor science**, E. L. MOSELEY (*Yonkers-on-Hudson, N. Y.: World Book Co., 1919, pp. X+404, pls. 16, figs. 244*).—This is a nature-study book written in language simple enough for students in the sixth or seventh grades.

**Housewifery: A manual and textbook of practical housekeeping**, L. R. BALDERSTON (*Philadelphia: J. B. Lippincott Co., 1919, pp. [VII]+353, pl. 1, figs. 175*).—This book is the outgrowth of many years of experience in housekeeping and in teaching housewifery to groups of practical housekeepers, with emphasis upon the technical processes of the home. Its purpose is to help the individual homewoman and to serve as a text for study groups of rural extension and other clubwomen and in the housekeepers' courses given by schools and colleges. Among the subjects discussed are housewifery as a business, plumbing, heating and lighting, equipment and labor-saving appliances, household supplies and furnishings, storage, cleaning and care of rooms, beds, bathroom, kitchen, and metals, cleaning and renovation, disinfectants and fumigants, and household pests. Each chapter is followed by references to helpful literature. Suggestions for teachers with reference to methods of teaching, including practice work, an outline of a course of lessons in housewifery as given in a regular high school with a practice department, and a more detailed outline of lessons for use in schools, settlements, or other special classes or in rural-extension work are included.

**Industrial work for boys**, A. E. PICKARD (*St. Paul, Minn.: Webb Pub. Co., 1917, pp. 145, figs. 113*).—This book includes, among others, chapters on home projects in woodwork; home credit for work in agriculture, including soil study, a miniature farm with suggestive rotations, germination tests, garden work, weed, insect, and wood collections, study of birds and rodents, study of machinery, stock and grain judging, apple-tree grafting, and strawberry raising; and contests and club work, including corn, potato, tomato, poultry, and pig contests, canning as club work, savings banks, keeping accounts, and an

industrial exhibit. The work suggested has been done successfully for a number of years in the teachers' training department in the intermediate and upper grades and in the rural schools in Minnesota that were under the supervision of the author.

**Industrial work for girls**, A. E. PICKARD and M. C. HENEGREN (*St. Paul, Minn.: Webb Pub. Co., 1916, pp. 145, figs. 62*).—This book contains chapters on course and equipment, general industrial work, sewing in the rural school, principles of home science, the hot lunch, industrial club work, and home credit exercises. Practically all the exercises suggested have been successfully done in several rural associated schools, as well as in the grades and the teachers' training department at the central school under the supervision of the authors.

## MISCELLANEOUS.

**Report of Alaska Stations, 1917** (*Alaska Stas. Rpt. 1917, pp. 96, pls. 9*).—This contains the organization list and a report of the several lines of work carried on during the fiscal year ended June 30, 1917. Meteorological data and accounts of the extensive tests with field and garden crops and other lines of work are abstracted elsewhere in this issue.

**Thirty-first Annual Report of Colorado Station, 1918** (*Colorado Sta. Rpt. 1918, pp. 47*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1918, a report of the director on the work of the station, and departmental reports.

**Report of Kansas Station, 1918** (*Kansas Sta. Rpt. 1918, pp. 63, figs. 5*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1918, and a report of the director summarizing the work and publications of the station. The experimental work recorded is for the most part abstracted elsewhere in this issue.

**Thirtieth Annual Report of Massachusetts Station, 1917** (*Massachusetts Sta. Rpt. 1917, pts. 1–2, pp. IX+63a+348, pls. 11, figs. 5*).—This contains the organization list, reports of the director and heads of departments, a financial statement for the fiscal year ended June 30, 1917, and reprints of Bulletins 173–181, previously noted. The experimental work recorded is for the most part abstracted elsewhere in this issue.

**Annual Report of New Jersey Stations, 1917** (*New Jersey Stas. Rpt. 1917, pp. XXVIII+563, pls. 14, figs. 10*).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1917, and for the College Station for the fiscal year ended June 30, 1917, a report by the director (E. S. R., 40, p. 198), and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

**Abstracts of papers not included in bulletins, finances, meteorology, index** (*Maine Sta. Bul. 275 (1918), pp. 227–244+XII*).—This contains the organization list of the station; abstracts of three papers previously noted; meteorological observations noted on page 17; a financial statement for the fiscal year ended June 30, 1918; an index to Bulletins 269–275, inclusive, which collectively constitute the thirty-fourth report of the station; and announcements as to the work, publications, and equipment of the station.

**Quarterly bulletin of the Michigan Experiment Station** (*Michigan Sta. Quart. Bul. 1 (1919), No. 3, pp. 147, figs. 16*).—This contains the usual list of available bulletins and the following articles: Michigan Live Stock Improvement; Beef and Pork Production Prospects, by G. A. Brown; Use of the Overshot Stacker in Michigan, by A. B. Cook; The Future of the Horse Market, by

R. S. Hudson; Where Sheep Should be Raised, by V. A. Freeman; Pasture Crops for Swine, by W. E. J. Edwards; Spring Inoculation of Legumes, by C. Nobles; Vinegar Making and Its Troubles.—Vinegar Bees, by Z. Northrup; Pure Seed for Spring Sowing, by B. A. Hollister; Michigan Experiments on Bean Disease Control, by G. H. Coons; The Dairy Outlook, by A. C. Anderson; Roundworms of Swine, Ascarids, by W. L. Chandler; New Pests Which Have Established Themselves in the United States and for Which We Should be on the Lookout, by R. H. Pettit; Selecting the Tractor, and Multiple Hitches, both by H. H. Musselman; Stock Poisoning from Bad Silage, by W. Giltner; M. A. C. Exhibit at the 1918 Inernational; Pedigreed Oats, and Pedigreed Alfalfa Seed, both by F. A. Spragg; Does it Pay to Test Seed Corn? by C. R. Megee; Notes on Maple Sirup Making, and Planting Trees for Ornament and Profit, both by A. K. Chittenden; Progress in Blow Sand Control, by F. H. Sanford; Most Called-for Varieties of Apples, Horticultural Notes, and Small Peach Crop in 1918, all by H. J. Eustace; Culling the Poultry Flock, by C. H. Burgess; Commercial Fertilizers for 1919, by A. J. Patten; Phosphorus for Spring Crops, and Let Us Preserve our Muck Soils, both by M. M. McCool; and Sterility in Cattle as a Complication of Infectious Abortion, by E. T. Hallman.

**Address of D. F. Houston, Secretary of Agriculture, before the Governors' Conference, Annapolis, Md., December 16, 1918** (*U. S. Dept. Agr., Off. Sec. Circ. 133 (1919), pp. 15*).—This deals with such matters as Federal and State cooperation, the need of clear thinking in agricultural matters, the Government and guarantied wheat prices, land and the returning soldiers, recent helpful legislation in agriculture, improving rural health, the functions of State departments of agriculture, etc.

**Laws applicable to the United States Department of Agriculture,** compiled by O. H. Gates (*U. S. Dept. Agr., Off. Solicitor, 1917, 4. Sup., pp. 137*).—This publication represents a revision of that previously noted (E. S. R., 33, p. 698), embracing legislation enacted from December 6, 1915, to September 8, 1916, inclusive.

# NOTES.

**Maryland Station.**—Dr. A. G. McCall has returned from service with the Army Educational Corps in France, and has resumed his duties in charge of soil investigations.

**Mississippi Station.**—The substation located at McNeill will henceforth be conducted in cooperation with the Bureau of Animal Industry of the U. S. Department of Agriculture. Special attention will be given to live stock, notably sheep and hogs, with reference to conditions in southern Mississippi. S. W. Greene of the Department has been appointed in charge of the substation.

The work formerly carried on at McNeill has been transferred to Poplarville, where E. B. Ferris, as assistant director in charge, is engaged in experiments with forage crops and fertilizers.

**Missouri University and Station.**—H. O. Allison, associate professor of animal husbandry and animal husbandman, has been appointed farm adviser for the Soil and Crop Improvement Association of Livingston County, Ill.

**Montana College.**—President James M. Hamilton resigned July 7, and has been succeeded by Alfred Atkinson, professor of agronomy and agronomist.

**Cornell University.**—The semi-centennial of the university was observed June 20 to 22, the elaborate ceremonies including the unveiling of a statue of the founder, Ezra Cornell.

A new chemistry building is to be built to cost about a million and a half dollars. The name of the donor has not yet been announced.

**Tennessee University and Station.**—It is announced that President H. A. Morgan is to continue as dean of the college of agriculture and director of the station. J. D. Hoskins, dean of the college of liberal arts, has been appointed assistant to the president; C. A. Willson, assistant dean of the college of agriculture; and C. A. Mooers, assistant director of the station.

A gift of $25,000, by Miss Mary Boyce Temple, for conducting special agricultural tests by the division of agricultural extension, has been made public.

**Vermont University.**—President Guy Potter Benton, for some time educational director of the American Army of Occupation in Germany, has tendered his resignation as president of the university, effective July 1.

**Washington College and Station.**—J. P. Fairbank, assistant professor and acting head of the department of agricultural engineering, has been made professor and head of the department. E. H. Steffen of the Forest Service of the U. S. Department of Agriculture has been appointed associate professor and head of the department of forestry. Roy O. Westley, instructor in agriculture at the School of Agriculture at Crookston, Minn., has been appointed instructor in farm crops. Joseph Passonneau, assistant in the office of markets, has been appointed director of that office vice Asher Hobson resigned.

**West Virginia Station.**—The legislature has converted into a regular permanent grant the appropriation which two years ago was made as a special emergency fund on account of war conditions. In addition, $30,000 has been granted for farm buildings, roads, fences, and other improvements at Morgantown, and $15,000 for the special needs of the Reymann Memorial Farms. It is expected to proceed with the building of additional barns immediately and the furnishing of the additional equipment needed.

Director J. L. Coulter has returned from six months' service in Army educational work in Europe.

# EXPERIMENT STATION RECORD.

VOL. 41. AUGUST, 1919. No. 2.

Within the past few months there has been organized, developed, and brought to successful completion one of the most remarkable educational projects of years. This project was the establishment and operation of a comprehensive educational system for the American Expeditionary Forces in Europe. Of great interest to every American citizen, its achievements have been of special significance to educators, and in particular, because of the large place assigned to instruction in agriculture, to those associated with agricultural education.

The bulk of the actual instruction provided was given in the spring of 1919, but efforts to formulate an educational program began much earlier. Toward the close of 1917, or soon after American troops began arriving in force in Europe, studies were commenced by Dr. Anson Phelps Stokes, secretary of Yale University, working under the auspices of the American University Union, to ascertain the conditions and the need and desire for educational work on the part of the soldiers and their commanding officers. Dr. Stokes reported after several months' inquiries that there was a general desire for the promotion of educational opportunities, embracing common school studies, industrial and vocational work, agricultural education, and general university training, and with particular emphasis upon industrial, vocational, and agricultural lines.

In April, 1918, announcement was made of the sanction by General Pershing of a broad educational movement, sponsored by the Y. M. C. A. but eventually to constitute a Department of Education as a component part of the Army. The purpose of this project was set forth as not only to increase the efficiency of the men while engaged in war but at the same time to prepare them for vocational usefulness after the war.

Subsequently the Army Educational Commission of the Y. M. C. A. was appointed to organize the new undertaking. This commission consisted of Dr. John Erskine of Columbia University, chairman and in charge of general collegiate instruction; Mr. F. E. Spaulding, superintendent of schools in Cleveland, Ohio, in charge of general

education of sub-collegiate grade; and President K. L. Butterfield, of the Massachusetts Agricultural College, in charge of agricultural, vocational, and general technical education. A budget of fifteen million dollars was drawn up, of which several million dollars was estimated as needed for textbooks alone. Four-fifths of the funds were to be provided by the Y. M. C. A., and the remainder by the American Library Association.

The organization of so vast an enterprise at top speed in a foreign land and under war conditions has been aptly described as a veritable "adventure in education." It was not, however, entirely a pioneer undertaking. Quite early in the war a system of instruction had been developed, apparently somewhat informally, in one of the Canadian divisions in France, and known as the University of Vimy Ridge. The object was announced as to equip men in active service for "greater efficiency in business, agriculture, and other great industries of the Dominion." The instruction included lectures for large groups of men, class work with smaller groups, and individual instruction for advanced students.

Late in 1917 what was known as Khaki College was organized by the Canadian Expeditionary Forces farther back of the lines, on a somewhat more formal basis with a chancellor, a senate, and an executive faculty. One of the eight departments of instruction was agriculture, with lecturers, drawn mainly from the ranks, in animal husbandry, field husbandry, horticulture, farm bookkeeping, agricultural English, and poultry. A system of credit in Canadian institutions for work of college grade was arranged, and instruction through short practical courses was also provided at some twenty lecture centers in France and England. About five hundred thousand dollars was allotted by the Dominion Government for the maintenance of this work, supplemented by about an equal amount from the Y. M. C. A. From October, 1917, to July, 1918, about nine thousand men had been enrolled in the various departments.

Some attention had also been given to agricultural instruction in the British Army. In August, 1918, through the joint efforts of the Training Branch of the General Staff and the Directorate of Agricultural Production, the British Government located at Etrun, just outside the devastated area surrounding Arras, the First Army School of Agriculture. Here a farm of three hundred acres was fitted up, and demonstrations and other instruction provided through the winter to officers and men awaiting demobilization. This school was one of the first of a series of British educational enterprises.

The suspension of hostilities on November 11, 1918, altered the purposes and plans of the American educational system to some extent, but intensified the demand for instruction on a comprehensive basis

during the many months before the return of the overseas men to this country could be completed. Efforts were accordingly increased to recruit from civil life the large administrative and supervisory force necessary and to provide the huge amount of textbooks, lectures, and illustrative material required. In this work educational institutions in this country heartily cooperated. For instance, nearly every agricultural college granted leaves of absence to one or more members of its instruction, research, or extension staffs and assisted in other ways. The Federal Department of Agriculture contributed, through the States Relations Service, a large amount of bibliographical material for use in preparing courses of study, as well as thousands of copies of Department publications, many of its lantern slides, sets of agricultural exhibits, and other matter.

Organization in Europe proceeded along the main lines originally projected. Special provisions were also made for embarkation points, leave areas, the occupied region of Germany, and other localities at which large groups of men were assembled.

The underlying purpose of the educational program was well set forth in the opening paragraph of a General Order of February 13, 1919, instituting the instruction: "The commander-in-chief invites the attention of the organization commanders and of all officers in the American Expeditionary Forces to the importance of national education. This citizen army must return to the United States prepared to take an active and intelligent part in the future progress of our country. Educational and occupational training should, therefore, be provided to meet the needs of the members of the American Expeditionary Forces in order that they may become better equipped for their future responsibility."

Provision was made for the detail of officers and men to participate in the instruction, and authorizing the Army Educational Commission of the Y. M. C. A. to assist in every way possible in the development of the educational system. On April 16, 1919, the Army assumed full responsibility for the enterprise, enrolling the commission and its workers as the Army Educational Corps. This action placed the project on a definite military basis, and greatly facilitated its rapid development.

The instruction afforded was of various grades, the intention being to meet the diverse needs of the Army as adequately as possible. The apex of the system was the A. E. F. University at Beaune. The bulk of the men, however, receiving instruction were of course enrolled for sub-collegiate instruction, chiefly at the many post and divisional schools. In addition numerous special agencies were developed. For instance, some of the most striking work in agriculture was done at the School of Agriculture at Allerey and the innumerable "farmers' institutes" and "farmers' clubs." It has been stated

that there was probably not a single regiment among the hundreds of the American Expeditionary Forces which was not reached by some of these means.

Mention should also be made of the arrangements for advanced instruction at the leading institutions of learning of the nations associated with this country in the war. Opportunity was afforded for details from the Army for the spring term of 1919 of about two thousand students at English universities, while the number enrolled in France has been estimated at four thousand. Some of these students were in agriculture, though the proportion of these is understood to have been comparatively small.

In order to provide "college and technical training beyond that offered at divisional educational centers" there was established the A. E. F. University. This institution was located at Beaune, some twenty-five miles from Dijon and in the Cote-d'Or vineyard district of east central France. The site had been previously utilized as an American hospital center, so that a number of buildings were immediately available. An immense amount of additional construction was still necessary, however, at the beginning of active operations in March, 1919, much of which was carried on by the soldier-students themselves. Ultimately approximately five hundred buildings were completed, mainly one-story structures of the barracks type 150 ft. long by 30 ft. wide, and some of the ready-made "quick erection" wooden type devised for general army use. One of the largest buildings was required for the library, this housing nearly five hundred thousand volumes supplied by the American Library Association, and comprising a surprising range of subjects and a wealth of bibliographical material.

The university was organized into fourteen colleges, including agriculture, fine and applied arts, business, vocations, education, engineering, correspondence, journalism, law, letters and science, medicine and chemistry, music, and citizenship. The combined faculty numbered approximately five hundred, and the student enrollment reached a maximum of nearly eight thousand.

The college of agriculture was among the largest and most completely organized in the institution. The courses of instruction were arranged under four departments, animal husbandry, agronomy, horticulture and forestry, and rural economics and sociology. These were further subdivided into about forty courses. The animal husbandry courses covered the feeding and breeding of animals, dairying, poultry husbandry, and animal hygiene, and those in agronomy included farm crops, soils, fertilizers, and farm machinery. There were seven courses in horticulture and forestry, dealing with forestry, vegetable gardening, orcharding, greenhouse man-

agement, and floriculture. The courses in rural economics and sociology dealt with farm management, agricultural economics, rural organization and sociology, and comparative agriculture. There was also a general course in agriculture offered as an elective for students in other colleges of the university.

The college was headed by Dean Hayward of the Delaware College as director, with Capt. E. N. Wentworth, formerly of the Iowa and Kansas colleges, as assistant director. The faculty numbered about fifty, nearly all of whom were originally from the instruction and extension forces of the agricultural colleges. A partial list of its members shows sixteen of these institutions represented, and might easily have been mistaken a few years ago for a roster of the staff of the Graduate School of Agriculture.

The student body varied at different times, but reached a maximum enrollment of over fifteen hundred and was even more composite than the faculty. Former agricultural college seniors from the Middle West rubbed elbows with prospective freshmen from New England or the South, and a captain from the Pacific coast sometimes found himself under instruction in stock judging or fruit growing or rural sociology by a sergeant from New York or Pennsylvania. This diversity of training and experience complicated the arranging of courses, but greatly added to the interest and value of recitations, conferences, club work, etc.

A high school education or its equivalent, together with some farm or agricultural college experience, was required for admission to the college. In order to give an opportunity for advanced work, instruction in most subjects was divided into what were known as A, B, and C courses, corresponding to beginners', intermediate, and more advanced grades. Certain prerequisites were set up for enrollment in B and C courses, such as a minimum amount of chemistry for advanced soils work or of elementary genetics for some of the instruction in animal breeding.

In quality, the student body ranked notably high. The average age of the students was probably not very much greater than in most colleges, but they appeared considerably more mature and manifested a distinctive seriousness of purpose. Evidence of this is shown by the fact that in numerous instances where their military units were returned to this country during the spring students voluntarily elected to remain to complete their courses. It is stated that the mid-term reports showed less than twenty-five men in the entire college doing unsatisfactory work.

In a general way the instruction was given much as in the agricultural colleges at home. Perhaps the most serious handicap encountered was the absence of laboratories. Considerable equipment was available, however, in farm machinery, and French illustrative

material as to live stock, horticulture, soils, and other lines was utilized as far as possible. Trips to farms, vineyards and gardens, cheese factories, and other rural enterprises were a distinctive and exceptionally valuable feature of the work. Opportunity was thus afford to observe at first hand the intensive farming and other special methods used in France. One trip of particular interest was to the district of La Perche, the home of the Percheron horse, and another to the grape-growing sections of Burgundy.

Closely coordinated with the college of agriculture was the university farm school at Allerey. This school was developed shortly after the opening of the university to provide instruction for soldiers who could not meet the college requirements for admission. It was located some fifteen miles from Beaune and, like the university, at the site of a former hospital center. Several hundred buildings, mostly of wooden construction, were hastily erected and instruction begun early in April.

The school faculty numbered about ninety, supplied in part by the American Educational Commission, but mainly by details from the Army. Supervision of its operations was vested in the college of agriculture, with Mr. H. J. Baker, director of extension work in Connecticut, as principal.

The instruction provided in the school was restricted to subjects dealing directly with agriculture and country life, except for a practical course in English. Animal husbandry, agronomy, horticulture, rural economics and sociology, and farm engineering comprised the principal courses. About half of the students were without previous farm experience, and a farm of about one hundred and fifty acres constituted an important asset of the school, providing two-hour practicums for each student in actual farm and garden practice.

No fewer than eight thousand applications were received for enrollment in the school. Accommodations were available, however, for only about three thousand students, making necessary a rigid selection of candidates.

It is estimated that from five thousand to ten thousand men received agricultural instruction in the post and divisional schools of the Army, and this number would doubtless have been considerably larger but for the inability to obtain sufficient instructors. These schools offered elementary courses of six to twelve weeks, usually enrolling from fifty to four hundred men each. They were held wherever available space could be obtained. In the occupied portion of Germany, abandoned agricultural schools were taken over in some instances and the surrounding land used for practical instruction. Live stock was sometimes secured for judging, and visits of observation to nearby farms were of frequent occurrence.

Of the special forms of instruction developed by the educational forces particular mention should be made of the "farmers' institutes." These, as the name implies, represented an adaptation of the well known farmers' institutes of this country. This form of instruction was found to be peculiarly well suited to the conditions and was one of the first means to be employed.

Early in January farmers' institute teams were organized at several embarkation points, notably Bordeaux and Brest, and the campaign was subsequently extended throughout the forces. By April a corps of twenty-six specialists was at work from the American Educational Commission, supplemented by scores of speakers drawn from the Army. In the Bordeaux region alone a staff of thirty-five workers was recruited. The number of men reached was correspondingly large. For the month of May it is estimated that four hundred institutes were held of from one to three days each, with an aggregate attendance of at least one hundred and fifty thousand. Some of these were doubtless attracted to the sessions by way of diversion, but it is reported that many even of this class became greatly interested. For thousands it was their first contact with educational work in agriculture.

The special advantage of the institutes was of course their adaptability to a wide variety of conditions. Meetings were held at all hours of the day, even the mess hour. The aim was to deal with all phases of agriculture, but special emphasis was put on the relations of the returning farmer-soldier to his work and to the rural community, and these discussions like the other instruction in rural economics and sociology are reported to have made particular appeal.

Scarcely less noteworthy were the "farmers' clubs." More than five hundred of these clubs were organized throughout the forces, including units at the college and school of agriculture and with an estimated aggregate enrollment of fully twenty thousand men. In a single division a membership of one thousand three hundred is reported. These clubs provided convenient units for group study and for arranging institutes and observation trips, in addition to their marked educational and social value in drawing together men of greatly varied experience for this common purpose. In some cases these clubs were even continued on shipboard and in demobilization camps in this country.

Under the auspices of the farmers' club of the college of agriculture, a permanent organization has also been perfected called the American E. F. Farmers' Club, including a Committee on International Agriculture. Among other activities it is planned to establish this fall a periodical, to be known as *World Agriculture* and to be of interest to professional agricultural workers, farmers, and the gen-

eral public. It is announced that the cooperation of several men of world-wide reputation in agricultural leadership has already been assured.

Early in May, 1919, the entire educational system was well under way, with arrangements perfected for an indefinite continuance and the extension of activities. So rapid, however, had been the withdrawal of the troops to this country that by June the situation was radically changed. The completion of the first term's work on June 7 marked the virtual close of the undertaking.

An interallied rural life conference, including a rural life pageant, was held at Beaune early in June and brought together a group of educators of international reputation for the discussion of agricultural problems. The addresses of these leaders constituted an impressive and appropriate termination of the work of the college and school of agriculture. Soon afterward the Army Educational Corps was disbanded, instructors and students alike were on their way homeward, and the A. E. F. University and its associated activities were added to the other memories of the war.

It is difficult to believe, however, that the results of this great project will be wholly ephemeral or unimportant. Leaving aside the great gain to the Nation in helping to keep up the morale of the troops through many long months of waiting, the mental stimulation afforded by instruction from a new corps of men in an unusual environment, and the great pedagogic value of the experiment to the Army and to educators generally, it would seem that the benefits to agriculture alone would have amply justified the enterprise. Who can estimate, for example, the number of men from agricultural colleges whose intentions to resume their education this fall have been thus crystallized into action? Or the much larger number previously unfamiliar with agriculture and its educational system whose interest has been aroused and whose whole life work has been redirected? Or the intangible but no less vital reaction upon the agricultural colleges themselves as instructors and students return from this novel undertaking?

By way of conclusion attention may be drawn, though perhaps needlessly, to one or two significant facts. The first is the tacit acceptance by all concerned of agricultural education as an integral component in this elaborate educational program. Since at least twenty-five per cent of the American Expeditionary Forces were from farm homes this may not seem surprising, yet it may be seriously questioned whether the same prominence would have been so readily conceded a generation ago.

In any case, it seems certain that nothing like the same success would have been secured under the conditions then prevailing. With-

out the substantial body of agricultural knowledge acquired by the slow but fundamental labors of the experiment stations, the U. S. Department of Agriculture, and other research agencies; the development of strong faculties and sound pedagogic methods in the colleges of agriculture and associated institutions of learning; and the training and experience of a vast corps of extension workers, county agents, and others in man-to-man instruction of a type readily adaptable to the emergency conditions, the accomplishments in agricultural education overseas would necessarily have been seriously retarded and restricted. As in our food production campaign, it was primarily because these institutions had been developed and strengthened year after year that agricultural education was ready when the call came, and was able to play so worthy a part in this great enterprise.

# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**The production and treatment of vegetable oils,** T. W. CHALMERS (*London: Constable & Company Ltd., 1918, pp. XI+152, pls. 9, figs. 97*).—This volume deals with the production and treatment of vegetable oils, primarily from the engineer's point of view. The material presented includes descriptions with accompanying plates and diagrams of machinery for the various stages in the production of oils, and chapters on the refining of oils, the hydrogenation of oils, the generation of hydrogen, soap making, the recovery and refining of glycerin, and the splitting of oils.

In the chapter on extraction of oils by chemical solvents the relative merits of the pressure and solvent extraction processes are discussed, with reference particularly to the value of the resulting residue as a cattle feeding stuff and as a fertilizer. The author is of the opinion that with modern methods the earlier objections to the solvent process as yielding both cake and oils unfit for consumption are unfounded, and that the residue from the solvent extraction process can be used to better advantage than the press-cake as a fertilizer and, with proper control of the amount of oil left in the residue, equally well as a feeding stuff.

**Vegetable fats and oils,** L. E. ANDÉS, trans. by C. SALTER (*London: Scott, Greenwood & Son, 1917, 3. ed., rev. and enl., pp. XI+351, figs. 93*).—In the third English edition of this book, the preceding edition of which has been previously noted (E. S. R., 25, p. 801), the subject matter has been revised and enlarged by H. B. Stocks to include modern methods for the extraction and purification of vegetable fats and oils.

**Gums and resins, their occurrence, properties, and uses,** E. J. PARRY (*London: Sir Isaac Pitman & Sons, Ltd., 1918, pp. VI+106, pl. 1, figs. 6*).—This is a reference handbook on the occurrence, properties including analytical constants, and uses of the more important true resins, gum resins, true gums, balsams, and medicinal resins.

**The natural organic coloring matters,** A. G. PERKIN and A. E. EVEREST (*London and New York: Longmans, Green & Co., 1918, pp. XXII+655; rev. in Analyst, 44 (1919), No. 516, pp. 119, 120*).—This volume of the series of monographs on industrial chemistry edited by E. Thorpe deals with the properties of the natural coloring matters, including a discussion of the facts which have led to a determination of their constitutions. The history of the employment of natural dyestuffs is traced in an introductory chapter. In the succeeding chapters the natural dyestuffs are grouped according to the constitution, where known, of their main tinctorial constituents. Where members of two widely distinct groups are present in the same plant, the description of the plant is given under the heading which from its present or past uses appears the more suitable.

An appendix contains lists from various sources of Indian natural dyestuffs, natural dyes of the Philippines, British plants capable of dyeing mordanted

wool, and leaves and flowers of wild and cultivated British plants capable of dyeing aluminum-mordanted cotton.

**Chemical analyses of Logan blackberry (loganberry) juices**, R. S. Hollingshead (*U. S. Dept. Agr. Bul. 773 (1919), pp. 12*).—The uses of the loganberry, the manufacture of the juice for commercial purposes, and the results of a number of analyses are reported.

It is pointed out that because of its pleasant flavor, loganberry juice is popular as a beverage, while the berry is also used for making jams, jellies, and for soda fountain service. The juice is naturally so sour that it is considered necessary to dilute and sweeten it when used as a beverage, since the addition of sufficient sugar to mask the acid makes the product too sirupy to drink unless diluted. "The flavor and color of Logan blackberry juice permit a dilution with from 2 to 3 parts of water, and the addition of 1 part of sugar. As a rule, the sirups prepared for soda-fountain use are made by adding sugar to undiluted juices, the composition running from about 1 part of juice and 1 part of sugar to, roughly, 3 parts of juice and 1 part of sugar."

In discussing the analyses it is stated that the Washington and Oregon juices differ considerably from those from California-grown berries.

Tentative limits are proposed for Washington and Oregon-grown juice of minimum and maximum nonsugar solids of 2.8 and 3.92 per cent, ash 0.25 and 0.43 per cent, and acids, as citric, of 1.42 and 2.33 per cent. For California juice the corresponding limits suggested are 3.06 and 3.74 per cent for nonsugar solids, 0.43 and 0.63 per cent for ash, and 1.06 and 1.96 per cent for acids, as citric.

**The distribution of urease in the seeds of cereals**, A. Němec (*Biochem. Ztschr., 91 (1918), No. 1–2, pp. 126–130*).—Analytical data are given to prove the presence of the enzym urease in grains such as wheat, rye, barley, and oats, and the connection between the presence of urease and proteins yielding arginin on hydrolysis is pointed out.

**Agglutination**, R. E. Buchanan (*Jour. Bact., 4 (1919), No. 2, pp. 73–105, figs. 3*).—In this address delivered before the Society of American Bacteriologists, December 27, 1918, the author discusses bacterial agglutination as essentially a colloidal phenomenon that can best be studied in the light of the modern work on colloidal and physical chemistry. An extensive list of literature references is appended.

**The oxidation of ammonia**, W. S. Landis (*Chem. and Metallurg. Engin., 20 (1919), No. 9, pp. 470–477, figs. 5*).—A résumé is given of the early investigations on the commercial oxidation of ammonia, followed by a discussion of the development of the cyanamid process as adopted in the Government nitrate plant at Muscle Shoals, Ala.

**Commercial oxidation of ammonia to nitric acid**, C. L. Parsons (*Jour. Indus. and Engin. Chem., 11 (1919), No. 6, pp. 541–552, figs. 13*).—This paper deals with past and present methods and apparatus for the oxidation of ammonia to nitric oxid for the production of nitric acid, including references to the method noted above. In particular the development of the U. S. Bureau of Mines converter is discussed, and tables are given showing its efficiency. The principle of the converter is the catalytic action of four cylindrical superimposed layers of platinum gauze so arranged inside the fire-brick lining of the converter that the inside surface is always reflecting against another red hot surface, no outside heat being required except that generated by the reaction itself. The results obtained in 160 determinations indicate that a 92 per cent efficiency with 10.5 per cent ammonia and with 200 cu. ft. per minute capacity can be easily reached with this converter.

In conclusion the author discusses certain factors influencing the yield in all forms of apparatus using platinum as a catalytic agent for the oxidation of ammonia.

**Manual of the chemical analysis of rocks**, H. S. WASHINGTON (*New York: John Wiley & Sons, Inc., 1919, 3. ed., rev. and enl., pp. XII+271, pl. 1*).—For the third edition of this manual (E. S. R., 16, p. 638), the subject matter has been thoroughly revised and considerably enlarged by introducing some changes in details of procedure, including new methods, treating in much greater detail the methods previously described and placing more stress on the sources of error both in operations and in methods.

**A new indicator for acids and bases**, M. CHAUVIERRE (*Bul. Soc. Chim. France, 4. ser., 25 (1919), No. 3, pp. 118, 119*).—A filtered aqueous extract of red beets is said to be a very sensitive indicator for acids and bases. The extract, which is a violet-red, opalescent liquid, retains its color in the presence of acids and turns a deep yellow in the presence of alkalis. Test paper can not be prepared from it as the color is not taken up by the paper.

**The volumetric determination of sulphurous acid**, T. J. I. CRAIG (*Jour. Soc. Chem. Indus., 38 (1919), No. 8, p. 96T*).—The method described consists in treating a water solution of the sulphurous acid, sulphite, or bisulphite to be tested with a known excess of acidified hydrogen peroxid and determining the residual hydrogen peroxid by titration with N/2 potassium permanganate.

**A method for the separation [and estimation] of formic, acetic, and lactic acids**, I. ONODERA (*Ber. Ōhara Inst. Landw. Forsch., 1 (1917), No. 2, pp. 231–259; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 674, II, pp. 461, 462*).—The literature on the separation of the volatile fatty acids and lactic acid from mixed solutions is reviewed, and a new method is described which is said to be more satisfactory than previous methods and to lend itself equally well to the separation of the three acids from the fermentation products of organic fertilizers and to the determination of lactic acid alone.

The essential features of the method are as follows:

An aqueous solution of the sample is extracted with ether, neutralized with alkali, acidified with phosphoric acid, and distilled with steam. The distillate is conducted into alkali, partially evaporated in a vacuum, and neutralized with sulphuric acid. The resulting sample is divided into three portions, each of which is oxidized with alkaline potassium permanganate. In one portion the excess of permanganate is titrated with sodium thiosulphate, the amount of permanganate used determining the formic and lactic acids together. In another portion the lactic acid alone is determined by precipitation of the oxalic acid formed from it on oxidation as calcium oxalate. Acetic acid is estimated in the third oxidized portion by extracting the ether, diluting the extracted acid to 100 cc., and distilling the solution until 95 cc. of distillate has collected.

**Sodium sulphite analyses**, F. C. VAN HEURN and W. BERTELS (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 1, pp. 16; Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser., No. 16 (1919), pp. 10*).—The results are reported of analyses of 19 samples of sodium sulphite used as an anticoagulant for rubber latex. The analyses included the reaction on phenolphthalein and content of sodium sulphate, sodium sulphite, and inclosed water and dirt. The methods employed have been noted from a previous communication (E. S. R., 39, p. 413).

The purest of the samples of crystallized sodium sulphite tested averaged 40 per cent of pure sulphite (theoretical 50 per cent), while the best sample of the anhydrous salt contained only 80 per cent sodium sulphite (theoretical 100 per cent). The necessity for control of the material sold as pure sodium sulphite is pointed out.

**Estimation of cyanogen compounds in concentrated ammonia liquor,** P. E. SPIELMANN and H. WOOD (*Jour. Soc. Chem. Indus., 38 (1919), No. 4, pp. 43T–45T*).—The basis of the scheme of analysis outlined is (1) the conversion of the ammonium thiocyanate into ferric thiocyanate and measurement in a tintometer of the depth of color obtained, and (2) the interaction of a further quantity of the original liquid with ammonium polysulphid, which converts the ammonium cyanid originally present into ammonium thiocyanate, and the estimation of the total ammonium thiocyanate as ferric thiocyanate. The difference between the results obtained in (1) and (2) is a measure of the quantity of cyanid originally present.

The method is described in detail, including the preparation of standard colors and the use of the Lovibond tintometer.

**Fat extraction apparatus,** E. GRIFFITHS-JONES (*Analyst, 44 (1919), No. 515, pp. 45–47, fig. 1*).—The apparatus, which was designed for use when the ordinary Soxhlet apparatus is not available, consists of an ordinary vertical condenser, the lower end of which passes through two corks, the upper one to serve as a connection for the extraction flask and the lower one for the reception of the extraction thimble. A side tube passes just through the upper cork, upward and parallel with the condenser, and then down the condenser tube to approximately the level of the water intake. The material to be extracted is placed in an ordinary extraction thimble covered with a plug of cotton wool and fitted over the lower cork. The condenser is then connected with an extraction flask containing the solvent and the extraction carried out over an electrically heated sand bath.

The extraction is said to be more rapid than with the ordinary type of Soxhlet and to require less of the solvent.

**Acidimetric titration of grain extracts and amino acids in the presence of alcohol,** V. BIRCKNER (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 245–254, figs. 2*).—A study at the Bureau of Chemistry, U. S. Department of Agriculture, of the cause of the change in acidity of grain extracts on the addition of alcohol led to the conclusion that the increased acidity noted is due to the fact that amino acids, which in aqueous solution are nearly neutral to phenolphthalein, react distinctly acid in the presence of alcohol. It is pointed out that this fact should be taken into account when making acidimetric titrations in alcoholic liquids containing amino compounds, such as various animal or vegetable extracts.

**Meat extracts, their composition and identification,** J. A. EMERY and R. R. HENLEY (*Jour. Agr. Research [U. S.], 17 (1919), No. 1, pp. 1–17*).—This investigation was conducted at the Bureau of Animal Industry, U. S. Department of Agriculture, to obtain information regarding differences in composition of meat extracts prepared from muscle tissue, livers, spleens, hearts, cured-meat cook water, roast-beef soak water, and bones, all of which materials have been used in recent years in the commercial manufacture of beef-extract.

The extracts used in the investigation were prepared in the meat extract department of a large commercial establishment according to the method ordinarily used, and also in the laboratory on a smaller scale but as far as possible in the same way. The extracts prepared in the laboratory were identical in physical appearance and organoleptic properties with those obtained by the commercial process. The methods employed in the analysis of the extracts were essentially those of Street et al. previously noted (E. S. R., 20, p. 959).

The quantitative results, which are presented in tabular form, show the following characteristic differences depending upon the nature of the extract:

"Liver extracts are low both in total nitrogen and 'meat-base' nitrogen,

have a low inorganic phosphorus to total phosphorus ratio, are very low in total creatinin, and as a rule are very high in nonnitrogenous organic matter.

"Spleen extracts are high in total nitrogen, low in 'meat-base' nitrogen, very low in creatinin, and lower than other extracts, liver excepted, in the inorganic-phosphorus to total-phosphorus ratio.

"Heart extracts are low in total nitrogen as compared with chuck and plate extracts, but much higher than liver. They contain considerable nonnitrogenous organic matter, being next to liver extracts in this respect. Heart extracts differ from liver and spleen extracts in total creatinin and in 'meat-base' nitrogen, the latter comprising at least 50 per cent of the total nitrogen in heart extracts.

"Pickle and cured-meat extracts are readily identified by the invariable presence of nitrates. . . . The quantity of total phosphorus present in such extracts is very small. In other respects cured-meat extracts are found to resemble true-meat extracts. Pickle extracts contain rather less creatinin than true-meat extracts.

"Chuck and plate extracts run high in total nitrogen, 'meat-base' nitrogen, and total creatinin and have a high inorganic-phosphorus to total-phosphorus ratio.

"The bone extracts prepared commercially and the extract prepared from roast-beef soak water resemble chuck and plate extracts."

Marked differences were also noted in the physical properties of color, texture, and "shortness," (an extract being termed "short" when it breaks quickly and easily upon testing its elasticity). Liver extracts are very dark brown, forming a red solution with a trace of fluorescence, and are gummy. Spleen and bone extracts are light chocolate or yellow-brown and are very "short." The other extracts are lighter than the liver extract but darker than the spleen extract and are usually very "short." Their solutions are dark but are not fluorescent.

In addition to the quantitative differences qualitative differences have been noted and made the basis of tests for the identification of liver and spleen extracts either when pure or in the absence of any considerable proportions of true meat extracts. These include an acetic-acid test suggested by R. M. Chapin for distinguishing spleen extract by the bulky yellowish-white precipitate formed; the Molisch test, which indicates the presence of liver extract; and the copper test, applied to the ash, a positive result indicating liver extract. The presence of copper is also indicated by the greenish tint of the ash.

It is stated in conclusion that complete identification of an extract can be made by the following determinations: Total solids, ash, sodium chlorid, total $P_2O_5$ inorganic $P_2O_5$, total nitrogen, "meat-base" nitrogen, preformed creatinin, creatin, Molisch test, acetic-acid test, test for starch and sugar if the Molisch test is positive, test for nitrates, and test of ash for copper.

**A new method for the determination of vanillin in vanilla extract.** A. W. Dox and G. P. Plaisance (*Amer. Jour. Pharm., 91 (1919), No. 3, pp. 167–170*).—The authors at the Iowa Experiment Station have applied the methods previously noted (E. S. R., 36, p. 318) for the determination of furfural to the determination of vanillin in vanilla extract.

Thiobarbituric acid in the presence of 12 per cent hydrochloric acid was found to give with vanillin a vermillion-colored precipitate. The method is not applicable to artificial extracts containing caramel as a coloring matter. Caramel is said to be easily detected by the brown precipitate formed on addition of phloroglucinol to the clarified extract containing 12 per cent hydrochloric acid. The use of lead acetate as a clarifying agent was found not to interfere with the determination.

**Evaluation of coconut and palm oils,** VIZERN and GUILLOT (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 4, pp. 117–119*).—The authors point out that it is irrational to calculate the acidity of coconut and palm oils in terms of oleic acid, and suggest that the evaluation of the acidity of these oils should be made on the basis of the mean molecular weights of their acids, 208 for coconut oil and 222 for palm oil.

**A revision of the copper phosphate method for the titration of sugar,** O. FOLIN and E. C. PECK (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 287–291*).—On account of divergent results obtained in the copper phosphate method of Folin and McEllroy (E. S. R., 38, p. 614) for determining sugar, due to variations introduced by different individuals in the manner of preparing the salt mixtures, the exact technique for preparing the mixture in order to obtain concordant results is described. This involves first mixing the phosphate and thiocyanate thoroughly in a mortar until the thiocyanate has abstracted enough water from the phosphate to give a solution, to which the sodium carbonate is then gradually added.

A slight modification of the method is described which is said to eliminate the small loss of copper due to reduction by the thiocyanate. This is accomplished by adding 1 cc. of saturated sodium carbonate to 5 cc. of the copper sulphate solution before adding the salt mixture (4 or 5 gm.). This requires the use of a 5.9 per cent solution of copper sulphate in place of the 6 per cent solution previously employed.

A few observations of value in connection with the titration are given, including certain time restrictions. The modification described is said to be applicable also to the determination of lactose in milk.

**Analysis of commercial saccharin, I–II,** H. D. RICHMOND and C. A. HILL (*Jour. Soc. Chem. Indus., 37 (1918), No. 14, pp. 246T–249T; 38 (1919), No. 2, pp. 8T–10T*).—Two papers are given.

I. *The estimation of o-benzoylsulphonimid from the ammonia produced by acid hydrolysis.*—The methods commonly employed for estimating commercial saccharin are discussed, and a method developed as the result of a study of the defects of the present methods is described, the technique of which is as follows:

Ten cc. of 7.5 N NaOH is boiled for 2 minutes with 0.6104 gm. of saccharin. Fifteen cc. of 10 N HCl is then added and the solution boiled for 50 minutes under a reflux condenser. After the heating is completed, 75 cc. of cold water is added and a current of air passed through the upper part of the flask to remove any acid vapor. Fifteen cc. of 7.5 N NaOH is added carefully and the ammonia distilled into an absorption flask, in which is placed 20 cc. of N/5 HCl. After about 70 cc. is distilled, the solution is titrated with N/10 alkali, using methyl red as indicator.

The method is said to be rapid, convenient, and accurate.

II. *The detection and estimation of impurities.*—A discussion is given of the tests in use for determining the impurities of most common occurrence in saccharin, including moisture, mineral matter, *p*-sulphonaminobenzoic acid, *o*-sulphonaminobenzoic acid, *o*-toluenesulphonamid, lead and arsenic, melting point, ammonia, easily carbonizable organic matter, sweetness, and the French Codex identification test.

**Determination of the amylolytic power of saliva,** L. GRIMBERT (*Jour. Pharm. et Chim., 7. ser., 19 (1919), No. 8, pp. 244–250; Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 9, pp. 312–315*).—The author recommends a standardization of the experimental conditions to be observed in determining the amylolytic power of saliva in order that results obtained may have a comparative value, and outlines the proposed technique.

**Colorimetric determination of the nonprotein nitrogen of the blood by Nessler's reagent**, A. GRIGAUT and F. GUÉRIN (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 22, pp. 1139–1142*).—The method employed is essentially that of Folin and Denis (E. S. R., 36, p. 316). Trichloracetic acid is used in place of metaphosphoric acid as the protein precipitant. The preparation of the reagents employed is described in detail.

**A precise method for the determination of small quantities of urea in blood**, A. GRIGAUT and F. GUÉRIN (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 1, pp. 25–27*).—The process described is one of direct nesslerization, but is said to differ from that of Folin and Denis (E. S. R., 36, p. 317) by a more energetic action of the urease, a more simple and rapid process of clarification, and the use of a more concentrated Nessler's reagent. The urease preparation consists of a suspension of 1 gm. soy bean flour and 0.4 gm. acid sodium phosphate in 100 cc. of distilled water. Trichloracetic acid is used as the precipitating agent. The reagents are prepared as described in the article noted above.

**Procedure for the volumetric micro determination of lipoids**, I. BANG (*Biochem. Ztschr., 91 (1918), No. 1–2, pp. 86–103*).—A method of determining fats and other lipoids is described which depends upon the fact that such substances reduce chromic acid quantitatively. The excess chromic acid is determined by titration with thiosulphate after addition of potassium iodid. The paper discusses with accompanying data the application of the method to the determination of fats and soaps, cholesterins, cholesterin esters, and phosphatids.

To determine cholesterin in the presence of fat, use is made of the fact that on the addition of a digitonin solution cholesterin digitonid is formed, which is insoluble in petroleum ether and can be separated from the fat which remains in solution. Cholesterin esters can be separated from neutral fats or phosphatids through the greater resistance of the former to hydrolysis and the insolubility in petroleum ether of the soaps formed by the hydrolysis of the fats. A similar method is used to separate cholesterin esters from phosphatids.

**The micro determination of blood lipoids**, I. BANG (*Biochem. Ztschr., 91 (1918), No. 3–4, pp. 235–256*).—This paper discusses in detail the application of the method noted above to the determination of the blood lipoids, including neutral fats, cholesterin, cholesterin esters, and phosphatids. The method is said to give very accurate results for total lipoids, neutral fat, and cholesterin, but not so exact results for cholesterin esters, and phosphatids.

**The evaporation of vegetables**, W. V. CRUESS (*Mo. Bul. Cal. State Com. Hort., 8 (1919), No. 3, pp. 93–100, figs. 8*).—This is a general article on the subject, including a discussion of the advantages and disadvantages of evaporated vegetables; descriptions of types of evaporators for industrial production, for community operation, and for home use; and directions for the preparation of vegetables for evaporation, temperature and air control during the process, and packing and storing of the dried vegetables.

**The sun drying of vegetables**, G. L. C. HOWARD (*Fruit Expt. Sta. Quetta [India] Bul. 8 (1918), pp. 20, fig. 1*).—This bulletin, which presents the results of an investigation of methods for the sun drying of vegetables in the arid climate of Quetta, India, contains information of general interest in connection with the dehydration of vegetables. The main principles of successful drying are considered to be rapidity of drying, and treatment of the fresh material by some form of heat, upon which depends the toughness or tenderness of the resulting product.

General directions are given for the preparation of the material, for the heating processes of steeping, scalding, or steaming, for drying, and for storage

and transportation of the dried product. Compression of the dried vegetables into bricks is recommended in the case of the more bulky vegetables and a simple hand press for the purpose is described and illustrated.

Special directions are given for the drying of French beans, cabbage, eggplant, carrots, peas, kohl-rabi, onions, potatoes, spinach, tomatoes, turnips, and several native vegetables. General and special directions are included for cooking the dried products. It is emphasized that all the vegetables, even those which are ordinarily fried, must be boiled after soaking.

**Sirup from sugar beets,** T. S. PARSONS (*Wyo. Farm Bul., 8 (1918), No. 5, pp. 67, 68*).—It is stated that a satisfactory sirup can be made on a small scale by boiling thinly sliced sugar beets for four hours in sufficient water to cover, to which has been added one tablespoonful of white wine vinegar for each beet. The liquid is then strained off and evaporated to a sirup. It is estimated that 10 sugar beets will make sirup equivalent in sweetening power to 1 lb. of sugar. In Scotland the beet sirup is used quite extensively in jam making. The fruit is added to the liquid after straining and the mixture boiled down until the required consistency of the jam is reached.

**Utilization of Arum as a food and for the manufacture of starch, glucose, and alcohol,** E. PANTANELLI (*Staz. Sper. Agr. Ital., 51 (1918), No. 1–2, pp. 69–82, pl. 1*).—The possibility is suggested of utilizing the rhizomes of *Arum maculatum* and *A. italicum*, two species of Arum growing wild in Italy, as a food for man and for domestic animals, or as a commercial source of starch. From laboratory tests it was estimated that a yield of 20 per cent starch, 20 per cent glucose, or 11 per cent ethyl alcohol could be obtained on a commercial scale.

**The preparation of xylose from corncobs,** K. P. MONROE (*Jour. Amer. Chem. Soc., 41 (1919), No. 6, pp. 1002, 1003*).—The method of preparing xylose from corncobs, as described by Hudson and Harding (E. S. R., 40, p. 17), has been improved by removing the adhesive gum by digestion with dilute alkali at 100° C. The residue yields on acid hydrolysis from 8 to 10 per cent of crystalline xylose of a quality superior to that obtained by the previous methods. The technique of the method is described in detail.

**Salvaging rain-damaged prunes,** W. V. CRUESS (*California Sta. Circ. 212 (1919), pp. 11, figs. 3*).—The purpose of this circular is to call attention to the damage to the California prune crop by the September rains of 1918, which destroyed at least 50 per cent of the value of the prune crop, causing a loss of probably not less than $5,000,000, and to offer suggestions for avoiding such a loss in the future.

Sulphuring the fruit on the trays for two or three hours, using hoods similar to thee one described by Bioletti (E. S. R., 41, p. 15), was found to check the mold and yeast growth which caused most of the damage, and to make it possible to dry the fruit without artificial heat. Fruit dried in this way is said to be of a lighter color than fruit dried in the usual way but to be salable and of excellent flavor.

Investigations of the utilization of damaged fruit for alcohol, vinegar, and sirup manufacture, and for hog feed are reported which indicate that in no case would the returns be very large. Good results were obtained in the use of damaged prunes in hog feed, provided no more than 15 per cent was incorporated in the feed.

**Evaporators for prune drying,** W. V. CRUESS (*California Sta. Circ. 213 (1919), pp. 30, figs. 18*).—This circular gives the results of a study of the principal evaporators in California, with a view to their more extended use in supplementing sun drying during such emergencies as noted above. Better

results are said to be obtained with the evaporators than with sulphuring, although the initial cost of an evaporator is much greater. It is pointed out, however, that the initial cost of an evaporator is only a fraction of the loss during one rainy season such as that of 1918.

A short discussion is given of the theory of evaporation and general principles and defects of some present evaporators, followed by detailed descriptions with specifications of the Oregon tunnel evaporator, an air-blast evaporator for wooden trays, and the small Young stack evaporator. General descriptions are given of the kiln evaporator, Watsonville stack evaporator, and the Anderson tunnel evaporator.

Attention is called to the necessity in designing an evaporator of making provision for sufficient heat production and radiating surface, good air circulation, and control of temperature. For the small dry-yard, the Young type of small stack evaporator is recommended, and for the average-size yard, the Oregon tunnel evaporator. Where wooden trays are to be used the air-blast evaporator is considered best.

**Scientific methods in the production, classification, and manufacture of rubber,** G. VAN PELT, (*Inst. Colon. Marseille, Bul. Caoutchoucs, No. 1, (1919), pp. 51*).—This bulletin discusses the principal operations connected with the exploitation of rubber from the production to the manufactured objects, with a view to introducing a more scientific control of the various processes. As a means to this end, the author recommends the establishment of laboratories on the plantations, the collaboration of the scientific staff of the plantation with the special laboratories, both nonofficial and official, in the producing countries, the establishment of scientific standards for estimating the value of rubber, the creation of a scientific organization for the study of questions applying to the rubber industry, and the collaboration of this organization with the technical service of the rubber factories.

## METEOROLOGY.

**Relation between vegetative and frostless periods,** J. B. KINCER (*U. S. Mo. Weather Rev., 47 (1919), No. 2, pp. 106–110, pls. 8, figs. 5*).—The relation between the frostless period and the length of the period during which the mean daily temperature is 43° F. or above is discussed on the basis of a series of eight charts showing (1) the average dates in spring when the daily mean temperature rises to 43°, (2) the dates in autumn when it falls below that value, (3) the average number of days when the mean daily temperature is 43° or higher in different sections of the country, (4) the normal mean daily temperature on the average date of the last killing frost in spring for all regular Weather Bureau stations in the United States, (5) similar data for fall frosts, (6) and (7) the average number of days in spring and fall, respectively, by which the potential growing season is shortened by frost, and (8) the total number of days that the average frostless season is shorter than the vegetative period.

It is shown that the advent of the vegetative period in the average year ranges from February 1 in the northern part of the Gulf States to May 1 in extreme upper Michigan and northern New England, and that this period comes to an end, on the average, about the middle of October in the extreme northern districts, but continues till the end of the year in the South. The length of the period ranges from less than 180 days in the extreme north and in the central and northern portions of the Rocky Mountain region, to 365 days in the South Atlantic and Gulf districts, and also in the central and southern Pacific coast sections.

The normal daily march of temperature is closely allied with the annual march in establishing the vegetative period. In most of the country the average frost-free date in spring corresponds to a mean daily temperature of from 52 to 66°, except along the central and north Pacific coast, the region of the Great Lakes, and along the middle and north Atlantic seaboard, where the temperatures are lower. Similar data for fall frosts are in close agreement with those for spring frosts. In limited areas, however, the first fall frost occurs on the average while the mean daily temperature is a degree or two higher than is necessary to cause a cessation in spring frosts in an average year. "Considering the records for all stations throughout the country the mean daily temperature on the average date of the last killing frost in spring is 52.1°, and on the average date of the first in fall it is 52.6°. . . . Owing to the fact that these temperatures corresponding to the average frost dates are so uniform, it is possible to determine very closely the average frost dates from the mean daily temperatures. . . .

"The only locality in which the frostless season is longer than the vegetative period is comprised in a small area along the north Pacific coast. In most of Washington, portions of upper Michigan and much of Minnesota, as well as along the north Atlantic seaboard, killing frost shortens the vegetative period by less than 20 days, but in much of the central portion of the country the difference in the two periods ranges from 40 to 60 days. From Virginia, Kentucky, Missouri, and Oklahoma southward this difference increases rapidly from 60 to more than 100 days in the northern portions of the Gulf States. Southward from the upper Mississippi Valley to southern Arkansas the difference increases from 20 to 100 days, or from less than one to more than three months."

**Increase of precipitation with altitude**, A. J. Henry (*U. S. Mo. Weather Rev., 47 (1919), No. 1, pp. 33–41, figs. 2*).—Reviewing observations bearing upon this subject in different parts of the world, the author concludes that "the main features of the precipitation-altitude relation are essentially as follows:

"The trend of the mountains must be in such a direction as to cause an ascent of the air masses which encounter them. Mountain systems whose axes are parallel, or nearly so, with the direction of the rain winds cause little or no increase in precipitation.

"The inclination of the slope of the mountain is of great importance; the steeper the slope, other things being equal, the greater the precipitation. The quantity of rain or snow which falls anywhere is also conditioned upon the initial temperature and relative humidity of the air at the beginning of the ascent. Obviously, it also depends, in no small degree, upon the duration of the winds from the rain quarter, or, in other words, upon the rate of movements of the atmospheric disturbance with which the rain winds are associated.

"The altitude of the zone of maximum precipitation appears to vary slightly with latitude, being lowest in the Tropics—a little less than 1,000 meters—and highest in temperate latitudes, say, between 1,400 meters and 1,500 meters. It has also a seasonal variation, being highest in summer and lowest in winter."

**The rainfall of France: Variations with altitude**, E. Mathias (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), Nos. 2, pp. 105–108; 4, pp. 239–242; 7, pp. 358–360, fig. 1; abs. in Rev. Sci. [Paris], 57 (1919), No. 2, pp. 61, 62; U. S. Mo. Weather Rev., 47 (1919), No. 1, p. 41*).—The author concludes from observations at different places and altitudes that "the precipitation-altitude relation in France may be expressed closely with the formula, $R=R_1+kA-k'A^2$, in which R represents the rainfall in millimeters at altitude A (in meters), $R_1$ the rainfall at a lowland station, $k$ the coefficient of increase with altitude, and $k' A^2$ a

term to take care of the decrease of rainfall above a certain elevation. For the Puy du Dome, and probably for the rest of France, $k'$ is 1/20,000; thus, the formula becomes, $R=R_1+kA-\frac{1}{2}(A/100)^2$."

On a map of France the author shows the values of $k$ for each Department. "$k$ varies uniformly with latitude, ranging from 0.5 in the Pyrenees (latitude 43°) to 1.2 in the north (latitude 50°)."

The rainfall may vary widely with the position and altitude of the rain gauge on a given parallel of latitude, but if the gauges are sufficiently numerous the algebraic sum of the variations is zero.

**Urban v. suburban temperatures**, J. W. REDWAY (*U. S. Mo. Weather Rev., 47 (1919), No. 1, pp. 28, 29*).—Reviewing briefly records made at Battery Park, New York City, and Mount Vernon, N. Y., the author reaches the general conclusion that "suburban days are somewhat warmer and suburban nights are somewhat cooler than urban days and nights." He agrees with Kimball's view that "the blanket of moisture, smoke, and dust over a city tends to prevent radiation of heat at night, and during the day arrests much of the heat which reaches the suburban station."

**Classification of clouds** (*U. S. Dept. Agr., Weather Bur.* [*1919*], *pp.* [*15*], *pls. 12*).—This is a series of colored plates with brief explanatory matter to aid observers in the identification of the several cloud forms, namely, cirrus, cirro-stratus, cirro-cumulus, alto-cumulus, alto-stratus, strato-cumulus, nimbus, cumulus, cumulo-nimbus, stratus, fracto-stratus, and fracto-cumulus, according to the international system of classification. A table of measurements of heights of clouds at different places, namely, Potsdam 1896–97, Blue Hill 1890–91 and 1896–97, Toronto 1896–97, Washington 1896–97, Allahabad (India) 1896–97, and Manila 1896–97, is also given.

**Monthly Weather Review** (*U. S. Mo. Weather Rev., 47 (1919), Nos. 1, pp. 64, pls. 17, figs. 19; 2, pp. 65–142, pls. 17, figs. 33*).—In addition to weather forecasts, river and flood observations, halo phenomena, and seismological reports for January and February, 1919; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during January and February, 1919; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

*No. 1.*—Work of the Smithsonian Astrophysical Observatory at Calama, Chile, by C. G. Abbot; Terrestrial Weather and Solar Activities, by C. F. Marvin; Influence of the Solar Eclipse of June 8, 1918, upon Radiation and Other Meteorological Elements (illus.), by H. H. Kimball and S. P. Fergusson; Proposed Magnetic and Allied Observations During the Total Solar Eclipse of May 29, 1919, by L. A. Bauer; Simultaneous Occurrences of Lunar Halos and Coronas, by C. F. Brooks; Lunar Halo and Paraselenic Circle Observed at Colony, Wyo.; Notes on the Comparison of Anemometers Under Open-air Conditions, by A. N. Shaw; Southern California Windstorm of November 24–26, 1918 (illus.), by F. A. Carpenter; The Terrific Windstorm on Mount Wilson, Cal., November 24–26, 1918 (illus.), by W. P. Hoge; A New Altitude Record (reprinted); Urban v. Suburban Temperatures, by J. W. Redway (see above); Evaporation in the Canal Zone (illus.), by H. G. Cornthwaite; Evaporation Compared With Vapor Pressure Deficit and Wind Velocity (illus.), by E. S. Johnston; Increase of Precipitation with Altitude (illus.), by A. J. Henry (see p. 119); Altitude Relations of Rainfall in France, by E. Mathias (abs.); The Conservancy Weather and Flood Warning Service (reprinted); and General Classification of Meteorological Literature, by C. F. Brooks (see p. 121).

*No. 2.*—Trans-Atlantic Flight from the Meteorologist's Point of View (illus.), by W. R. Gregg; The Flight of Aircraft and the Deflective Influence of the Earth's Rotation (illus.), by C. F. Marvin; United States Still Holds Airplane Altitude Record (reprinted); Air Routes to Australia (illus.), by G. Taylor; Report of the British Civil Aerial Transport Committee, by W. R. Gregg (rev.); Meteorology During and After the War, by H. G. Lyons (extracts); Meteorological Service of the Army, by G. O. Squier (reprinted); [Bibliography of papers by R. DeC. Ward, on Influence of Weather on Military Operations], by M. Welch; Measurements of the Solar Constant of Radiation, by C. G. Abbot; The Direction of Rotation of Cyclonic Depressions (illus.), by J. S. Dines; Additional Note on Clockwise and Counterclockwise Cyclonic Motions with Application to the Flight of Aircraft, by C. F. Marvin; Weather Maps in London Newspapers (rev.); Congress of Scandinavian Geophysicists in Gothenburg, August 28–31, 1918. by H. Pettersson; Weather Forecasting (illus.), by V. Bjerknes; On the Structure of Moving Cyclones (illus.), by J. Bjerknes; Possible Improvements in Weather Forecasting, by V. Bjerknes; Synoptic Study of Hydrographical Phenomena (illus.), by H. Pettersson; Notes on the Fluctuations of Mean Sea Level in Relation to Variations in Barometric Pressure, by T. B. Franklin (abs.); The Effect of Wind on Sea Level (extract); An Instrument for Accurate and Rapid Density Measurements on Board Ship, by A. L. Thuras (abs.); An Electrical Instrument for Recording Sea Water Salinity, by E. E. Weibel and A. L. Thuras (abs.); William Allingham (reprinted); Captain Melville Willis Campbell Hepworth (reprinted); Relation between Vegetative and Frostless Periods (ilus.), by J. B. Kincer (see p. 118); and Weather Control of the Periodical Cicada, by W. E. Hurd.

**Climatological data for the United States by sections** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 6 (1919), Nos. 1, pp. 211, pls. 4, figs. 2; 2, pp. 211, pls. 4, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1919, respectively.

**General classification of meteorological literature**, C. F. Brooks (*U. S. Mo. Weather Rev., 47 (1919), No. 1, pp. 42, 43*).—A general classification designed to furnish a logical, simple, and easily remembered system for filing notes, pamphlets, and references is given.

## SOILS—FERTILIZERS.

**Studies in the reversibility of the colloidal condition of soils**, A. B. Beaumont (*New York Cornell Sta. Mem. 21 (1919), pp. 479–524*).—Investigations with artificially prepared colloids, including colloidal silica, alumina, and ferric oxids, and humus, together with Dunkirk and Clyde surface soils and Dunkirk and Vergennes subsoils are described in an effort "to throw some light on the physical changes, and their effects, which a soil undergoes with variations in its moisture content, especially on being wetted and dried. . . . It has resolved itself into a study of the reversibility of the colloidal condition of soils." The reversibility of the colloidal state of soils is believed to include "all cases brought about by physical, chemical, and biological agencies or a combination of these," and is represented as follows:

$$\text{Noncolloidal state} \rightleftarrows \text{Collodial state} \begin{cases} \text{Sol} \\ \uparrow\downarrow \\ \text{Gel} \end{cases}$$

Evidence bearing on the occurrence of various colloidal materials in the soil is presented, and investigations dealing with the effect of moisture changes

on soil properties are reviewed. Most of these studies are said to deal with soil properties other than colloidal, and with methods other than those employed in colloid chemistry. The results of a rather critical study of different methods for measuring colloidality and of certain difficulties encountered in attempting to apply various methods are also presented and the details of the methods finally developed for use in these investigations described. The methods comprise a modification of Mitscherlich's water-vapor-adsorption method (E. S. R., 17, p. 838), a modification of Ashley's dye-adsorption method,[1] and the so-called suspension method.

Observations were made on the effect of drying upon the adsorption of dyes by artificial preparations of the principal colloidal materials found in the soil; the effect of different factors on hygroscopicity in the soils studied by the water-vapor-adsorption method including time, remoistening, the permanency of the effect of drying, alternate wetting and drying, drying at high temperatures, long immersion in water, and leaching; the adsorption of various dyes by differently treated soils; the amount of Clyde soil subjected to different moisture treatments remaining in suspension in distilled water and in 4 per cent ammonia 30 minutes after shaking; the effect of alternate wetting and drying on the amount of humus extracted from a Clyde soil; the relative intensities of water extracts of Dunkirk and Clyde surface soils; and the chemical nature of soil colloids. The results of the experimental work may be summarized as follows:

The adsorption of water vapor was not materially affected by variations of from 5 to 10° between 15 and 40° C. The chemical composition of certain soil-forming minerals affected the adsorption of dyes, acid dyes as a rule being more strongly adsorbed by basic minerals than were basic dyes, while the latter were more strongly adsorbed by acid minerals. Diamin sky-blue, one of the few dyes strongly adsorbed by colloidal ferric oxid, was adsorbed the most strongly of all those examined. It was also adsorbed by alumina, but not by silica. An alga and a fungus adsorbed considerable amounts of the dyes used, indicating that the growth of lower forms of plant life in the soil affects its adsorptive capacity. Both air-dried and oven-dried colloidal silica, alumina, ferric oxid, and humus, immersed in dye solutions, showed a reversal of their capacity to adsorb dyes, and also adsorbed water vapor rapidly.

The difference in hygroscopicity between a moist and an air-dried soil was found to persist for three months at least, while remoistening air-dried soils to a moisture content above that originally held did not cause a reversal of hygroscopicity immediately nor within three months. The alternate wetting and drying of soils did not affect the hygroscopicity after the first drying. Subsoils that had been wetted and dried 32 times showed a significant cumulative decrease in hygroscopicity. Hygroscopicity decreased successively with air-drying, oven-drying, and ignition, the change from the moist to the air-dry condition producing a greater change than that from the air-dry to the oven-dry, while the change from the oven-dry to the ignited condition was greater than from the air-dry to the oven-dry condition. Some ignited soils had comparatively high hygroscopic values. Long immersion under water increased the hygroscopicity of a soil poor in organic matter, and decreased it in one rich in organic matter. Leaching a soil increased its capacity for adsorbing water vapor.

Oven-drying and ignition reduced the adsorption of methylene blue. Clyde soil, rich in organic matter, showed less effect due to drying than did the other soils, this being contrary to the results secured with water-vapor-adsorption.

[1] U. S. Geol. Survey Bul. 388 (1909) pp. 1–65.

Effects of air-drying and alternate wetting and drying were so irregular, as measured by dye adsorption, as to be deemed inconclusive. The immersion of a soil in water for 2 years increased its adsorptive capacity for methylene blue. Leaching a soil also increased its adsorption of methylene blue. Less diamin sky-blue was adsorbed than of methylene blue. Ignition decreased the adsorption of this dye.

Drying decreased the amount of soil that would go into suspension in distilled water and in 4 per cent ammonium hydroxid. Drying 32 times as compared with one drying decreased the amount of suspended matter.

Extractions of humus with 4 per cent ammonium hydroxid showed no effect on humus due to drying, while extractions with distilled water showed an increase in the solubility of the coloring matter of humus due to drying.

Oven-drying soils previous to their standing in an excess of water increased the amount of iron soluble in weak hydrochloric acid, while sterilization checked the formation of this easily soluble colloidal material.

The water-vapor-adsorption method is deemed better than the dye-adsorption method for measuring the total surface of soils. Finally, it is concluded that "drying a surface soil once produces as much effect on the colloidal material as repeated dryings alternated with moistenings. With a subsoil there is a cumulative effect due to alternate drying and wetting. Drying a soil once or many times produces a change in the colloidal material from which it does not immediately recover on being wetted. Drying soil affects indirectly the reversibility of its colloidal condition, the changes being directly produced through biological and chemical action."

A bibliography of 58 titles is appended.

**H-ion concentration—soil type—common potato scab**, L. J. Gillespie and L. A. Hurst (*Soil Sci., 6 (1918), No. 3, pp. 219–236, figs. 3*).—In this paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the authors describe observations made on a number of soil samples representing both Caribou and Washburn loam from northern Maine. These are held to indicate that an excellent correlation exists between the H-ion concentration of the soil and the occurrence of common scab (actinomycosis) of potatoes, soils having an H-ion exponent of as low as 5.2 being found to rarely produce scabby potatoes. Similar results were also secured with a few soils of different origin and type. The limiting zone of the H-ion exponent for the potato scab organism appeared to be approximately the same for soil as for culture media as previously determined (E. S. R., 40, p. 644).

The characteristic difference of the H-ion exponent found to exist between the Caribou and Washburn loams in earlier experiments (E. S. R., 38, p. 620) has been confirmed, typical Caribou loam having an H-ion exponent of about 4.8 and being free from scab, while Washburn loam was generally less acid and usually produced scabby potatoes. It is stated, further, that a considerable number of soils having the exponent 5 may be successfully grown to potatoes and truck crops without liming. This indicates that exponent 7 (representing physico-chemical neutrality) can scarcely be regarded in general as the so-called rational end-point in lime requirement tests, no such standard end-point being deemed justified without further experimental work with specific crops.

Satisfactory methods of determining the H-ion concentration of soils both colorimetrically and electrometrically are also described. The results secured in applying the two methods to a large number of soils are said to have agreed within the limits of experimental error.

A list of 23 titles comprising the literature cited is appended.

Variability in soils and its significance to past and future soil investigations.—II, Variations in nitrogen and carbon in field soils and their relation to the accuracy of field trials, D. D. WAYNICK and L. T. SHARP (*Univ. Cal. Pubs. Agr. Sci., 4 (1919), No. 5, pp. 120–139, pl. 1*).—In a further contribution to the subject (E. S. R., 39, p. 815) the authors present data showing the amount of variation found in total nitrogen and total carbon in silty clay loam soil at Davis and in blow sand at Oakley (Cal.). The total area sampled at each point was a little more than 1.3 acres, the fields being selected for their apparent uniformity. Altogether 100 soil samples were taken from each area, 80 samples being distributed uniformly at 30-ft. intervals over the entire area, 40 samples at 15-ft. intervals in 5 different parts of the field, and 12 samples taken within an area of approximately $\frac{1}{48}$ acre in the center of the field. Statistical methods have been applied to the interpretation of the data secured, and the limits of accuracy of the method employed in the nitrogen determinations are discussed at some length. The results obtained may be summarized as follows:

The extreme range for nitrogen in the Davis soil was from 0.077 to 0.124 per cent, and in the Oakley soil from 0.022 to 0.063 per cent, while for carbon the determinations varied from 0.903 to 1.383 per cent in the Davis soil, and from 0.252 to 0.947 per cent in the Oakley soil, indicating that results secured with one or a few samples would probably be unreliable. A study of the relation of soil samples taken from small areas and at short distances apart to those from a larger area and to the whole number of samples taken is held to indicte that "it is unwise to attempt to apply the statistical constants calculated for one area to other areas even though in themselves apparently uniform, since the respective variabilities may be very different." When the variations in the area to be sampled are known, the making of a composite sample is deemed to be fully justified. The relation of variations in a small area to differences between soil types is discussed, and the conclusion reached that only after very careful sampling can such differences be determined with certainty. The advantages of estimating the number of soil samples necessary to secure any given degree of accuracy are indicated.

[Report of] soil investigations (*North Dakota Sta. Rpt. 1917, pp. 15, 16*).—Extraction with ammonium sulphate solution and with plain distilled water of both the surface and subsurface 6 in. of limed and unlimed soil grown to wheat continuously for about 40 years, and of a virgin sod resulted in the removal of varying amounts of soluble materials from the differently cropped soils by means of the ammonium sulphate solution. A greater amount of soluble calcium was removed from the virgin soil than from the wheat soil, while the amount of soluble magnesium was practically the same for both soils by extraction with ammonium sulphate but greater by aqueous extraction from the wheat soil. There appeared to be little, if any, difference between the two soils in the amount of soluble iron and aluminum.

With the addition of lime to these soils an increase in soluble calcium and a decrease in soluble iron and aluminum was observed. The amount of soluble magnesium increased slightly in all cases, but the proportion of this ingredient to soluble calcium was much less in all the limed samples. Aqueous extracts of the limed soils showed a much smaller content of soluble calcium and magnesium for the virgin soil than for the wheat soil.

These results are held to indicate that continuous cropping to wheat has caused a loss of calcium carbonate in this soil, and that the proportion of soluble magnesium to soluble calcium has undergone a change. No definite results have thus far been secured regarding soluble iron and aluminum.

Azofication, J. E. GREAVES (*Soil Sci., 6 (1918), No. 3, pp. 163–217, figs. 2*).—This paper, a contribution from the Utah Experiment Station, comprises a

comprehensive review of the literature dealing with nonsymbiotic nitrogen fixation in the soil. Briefly tracing early studies concerning nitrogen fixation by soil organisms, the author then deals with the distribution and food requirements of the azofiers; the reaction of the media; the effect upon azofication of volatile and nonvolatile antiseptics, organic soil constituents, colloids, manure, water, temperature, light and other rays, aeration, season, crop, and climate; sources of energy for Azotobacter; metabolism and pigment production in Azotobacter; morphology of the nitrogen-fixing organisms; the relation of Azotobacter to other organisms and to nitrate accumulations; the action of azofiers on plant food; soil inoculation; and soil gains in nitrogen.

A bibliography of 211 titles is appended.

**Studies on nitrification in natural soils and its importance from an ecological point of view**, H. HESSELMAN (*Meddel. Stat. Skogsförsöksanst., No. 13–14 (1916–17), pt. 1, pp. 297–528, XXXIII–LVIII, figs. 30*).—This paper, in addition to a lengthy discussion of the investigation already noted from another source (E. S. R., 40, p. 418), embraces a detailed presentation of the experimental results obtained, together with a bibliography of 87 titles.

**The effect of regeneration measures on the formation of nitrates in the soil and its importance in the regeneration of coniferous forests**, H. HESSELMAN (*Meddel. Stat. Skogsförsöksanst., No. 13–14 (1916–17), pt. 2, pp. 923–1076, XCI–CXXVI, figs. 48*).—The author describes investigations having to do with nitrification in forest soils and with the effect upon nitrification of measures usually employed in the care of the forest. The more important results secured in coniferous forests may be summarized as follows:

Little or no nitrification was observed to occur in the humus covering of mossy coniferous forests, the organic nitrogen present not being transformed beyond ammonia, even in the best and most productive forests. Fellings which permitted a strong access of light exerted a marked influence on the transformation of nitrogen. Where the humus covering was rather thin and loose, being composed chiefly of mosses and fallen needles, felling sometimes resulted in an active transformation of humus nitrogen into nitrate, said to be due, among other things, to a radical alteration in the bacterial flora of the humus covering. An active transformation of humus nitrogen appeared to take place in raw humus but without nitrate formation.

The covering vegetation was thought to be an index to the nature of the nitrogen changes taking place, nitrification being indicated by the presence of the raspberry, *Epilobium angustifolium*, *Arenaria trinervia*, *Galeopsis bifida*, *Senecio silvaticus*, *Rumex acetosella*, etc., while *Aira flexuosa* predominated where nitrification was lacking. Thorough mixing of the humus with the mineral soil and decaying brushwood and timber and burning over the area resulted in the formation of nitrates even in markedly raw humus. It is stated that a close correlation appeared to exist between nitrification and the regenerative possibilities of the soil. Raw humus soils without nitrification were found to be difficult of regeneration. Experiments and observations in the field are held to indicate that young pine trees develop to better advantage in the presence of nitrification than without it, as is also thought to be the case with spruce.

In herbaceous spruce forests nitrification was usually observed, and felling resulted in such an increase of nitrates that nitratophilous vegetation became troublesome to the coniferous plants. In such instances the spruce developed in the small areas which did not lend themselves to any very marked development of the covering vegetation, and it was often found necessary to check the growth of this vegetation, the competition of which would otherwise prove fatal to the tree plants.

A bibliography of 51 titles is appended. See also a previous note (E. S. R., 40, p. 418).

**The solubility of the soil potash in various salt solutions,** D. K. TRESSLER (*Soil Sci., 6 (1918), No. 3, pp. 237–257, figs. 2*).—This paper, a thesis submitted to the faculty of the Graduate School of Cornell University, describes investigations in which a study was made of the effect upon the solubility of the potash contained in several soils of allowing them to remain in contact with various salt solutions of different concentrations until the systems reached equilibrium. Dunkirk silt loam and Genessee humus loam secured near Ithaca, N. Y., Whiteland clay subsoil and Yamhill silt loam from the vicinity of Corvallis, Oreg., Porters sandy loam and Durham sandy loam from North Carolina, and Merrimac fine sandy loam from the experimental plats of the Massachusetts Experiment Station comprised the soils examined. The salts employed included the component parts of commercial acid phosphate, viz., calcium sulphate and tri-, di-, and monocalcium phosphate, calcium carbonate, sodium nitrate, sodium chlorid, and sodium carbonate. About 125 gm. of dry soil, or its equivalent in moist soil, was placed in a liter of water, various amounts of the salts added, and the solutions allowed to stand for three weeks. The amount of $K_2O$ in parts per million of the solution was then determined. The results secured may be summarized as follows:

When commercial acid phosphate liberated potash in the soils used in this investigation the effect was found to be due to the gypsum which it contained. Calcium sulphate in solution increased the solubility of the potash compounds in some soils, this effect being much more marked in clay than in silt or sand and offering a possible explanation of the fact that only certain soils are benefited by applications of gypsum. Calcium sulphate solutions did not seem to be particularly active in dissolving the potash of silt and sands containing mica. It is deemed probable that on some, if not all fertile clay loam and clay soils, some potash is made soluble by the application of gypsum. In Dunkirk clay loam and silt loam, only a small amount of calcium suphate was required in the solution in order to affect materially the solubility of the potash, this possibly indicating why small applications of gypsum are quite beneficial on some soils.

The soil potash of Dunkirk silt loam was found to be somewhat more soluble in solutions of carbon dioxid and calcium bicarbonate than in a solution of carbonic acid containing the same amount of carbon dioxid. It is stated that soils high in organic matter may derive some soluble potash from the effect of the calcium bicarbonate in the soil water after the addition of a large amount of lime.

Sodium salts were quite active in dissolving potash from soils. The fact that sodium chlorid solutions were active in dissolving potash and that beets require sodium for proper growth is believed to explain why beets derive benefit from applications of salt, since they are very resistant to the tonic action of sodium chlorid.

A list of 29 titles comprising the literature cited is appended.

**Relation of fluorin in soils, plants, and animals,** L. A. STEINKOENIG (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, pp. 463–465*).—The author briefly reviews the work of other investigators, together with observations made by himself on the amount of fluorin present in both surface and subsoil samples of 9 different types of soil. He concludes that the original source of fluorin in the soil is such minerals as biotite, tourmalin, muscovite, apatite, fluorite, and phlogopite. In the soils examined fluorin occurred in amounts averaging 0.03 per cent, but a higher content may be expected in soils carrying larger

amounts of mica. The roots of plants absorb fluorin and transmit it to the animals which consume them, and animals may also obtain fluorin from spring water.

**Report upon the extent and character of the saline lands of the Madras Presidency**, W. H. HARRISON (*Madras Agr. Dept. Yearbook, 1918, pp. 13–25, pl. 1*).—Studies of the nature of the soluble salts present are reported, as are the results of tests of various native methods of improving the lands, such as adding organic matter, adding substances which produce acid on decomposition, mixing and washing the soil, and growing resistant plants.

**A peculiar alkaline tract in South Arcot district**, M. R. RAMASWAMI SIVAN (*Madras Agr. Dept. Yearbook, 1918, pp. 25–33*).—Scattered patches of soil made sterile by excessive amounts of sodium carbonate, soluble organic matter, and clay are described. A peculiarity of the soils is that they become friable and heave when dried out. This is attributed in part to the gas resulting from the decomposition of organic matter in the presence of the large amount of lime (3.5 per cent) which the soil contains.

**The alkali content of soils as related to crop growth**, F. T. SHUTT and E. A. SMITH (*Agr. Gaz. Canada, 6 (1919), No. 1, pp. 8–15*).—This paper has already been noted from another source (E. S. R., 40, p. 719).

**Soil survey of Faulkner County, Ark.**, E. B. DEETER and H. I. COHN (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 35, fig. 1, map 1*).—This survey deals with the soils of an area of 416,640 acres situated slightly north of the geographical center of the State and lying entirely within the Quachita Mountain belt of the Appalachian Mountain province. Topographically, the northern part of the county comprises tillable plateaus with intervening, rather narrow, lowland areas, while the southern part consists of alternating belts of ridges and narrow valleys with wide valleys of important farming land lying between these belts. In general, natural drainage is well established.

The upland soils of the county are of residual origin from Pennsylvanian sandstones and shales. Soils of alluvial origin also occur along the stream bottoms. In addition to rough stony land and riverwash, 17 soil types of 8 series are mapped. Conway silt loam, Hanceville gravelly fine sandy loam, Hanceville loam, and Hanceville stony loam, predominate, occupying 30.1, 18, 17.4, and 13 per cent of the total area, respectively.

**Soil survey of the Anaheim area, Cal.**, E. C. ECKMANN, A. T. STRAHORN, L. C. HOLMES, and J. E. GUERNSEY (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 79, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the University of California, deals with the soils of an area of 317,440 acres lying southeast of Los Angeles and fronting on the Pacific Ocean. The region comprises the most important agricultural sections of Orange County, together with small portions of Los Angeles and San Bernardino Counties, including the entire area covered by the Santa Ana survey (E. S. R., 13, p. 926), and a part of the survey of the Los Angeles area (E. S. R., 16, p. 1060). These earlier surveys have been revised in the classification and mapping of the soils in the present survey.

Most of the area consists of smoothly sloping plains, including alluvial fans and river flood plains, while broken hills occur on the north and east together with remnants of somewhat elevated old valley surfaces or marine terraces lying along the base of the hills or bordering the ocean front. The elevations range from sea level to 1,600 ft. above. It is estimated that from 50 to 60 per cent of the region has good natural drainage.

The soils of the area have been derived from residual, old valley filling or coastal plain, and alluvial material. In addition to such miscellaneous material

as rough broken and stony land, tidal marsh, riverwash, coastal beach and dunesand, and muck and peat, 28 soil types of 9 series are mapped. Hanford fine sandy loam, Hanford sandy loam, rough broken and stony land, and Yolo loam, occupying 14.9, 9.2, 8.9, and 8.6 per cent of the total area, respectively, are the prevailing types.

**Soil survey of Shelby County, Ky.**, C. VAN DUYNE, L. R. SCHOENMANN, and S. D. AVERITT (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 67, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the Kentucky Experiment Station, deals with the soils of an area of 244,480 acres situated in the north-central part of the State and lying within the Lexington Plain. The topography varies from undulating to rolling and hilly. Natural drainage is well established.

The upland soils of the county are residual from limestones and shales, while alluvial soils occur on the stream terraces and bottom lands. Eight soil types of 6 series are mapped. Shelbyville silt loam, Cincinnati silt loam, and Eden clay, occupying 45.4, 26.8, and 17.7 per cent of the total area, respectively, predominate.

S. D. Averitt briefly discusses the fertility of the different types of soils found in the county as indicated by chemical analyses of the surface and subsoil.

**Soil survey of Calhoun County, Mich.**, R. F. ROGERS and W. G. SMITH (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 54, figs. 2, map 1*).—This survey deals with the soils of an area of 443,520 acres situated in the south-central part of the State. The topography is said to be typical of a glaciated region, comprising rolling to hilly morainic belts with intervening strips having a level to gently undulating surface. Natural drainage is generally well established in the upland, although many swamps, ponds, and lakes occur throughout the region.

The soils of the county are largely of glacial origin, having been derived from ingneous and metamorphic rocks, while part of the material has come from sedimentary limestone, sandstone, and shale. In addition to muck and peat, which occupy 12.5 per cent of the total area, 22 soil types of 11 series are mapped. Coloma loam, Fox loam, and Bellefontaine loam, occupying 16.6, 15.2, and 11.3 per cent of the area, rsepectively, are the prevailing types.

**Soil survey of Amite County, Miss.**, A. L. GOODMAN, A. H. MEYER, R. W. MCCLURE, and B. H. HENDRICKSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 38, fig. 1, map 1*).—This survey deals with the soils of an area of 456,960 acres situated in the southwestern part of the State. The topography varies from almost level to hilly but is prevailingly rolling. Natural drainage is generally well established throughout the region.

The upland soils of the county have been derived from loessial material overlying Coastal Plain beds of sandy clay and gravel. The second bottom lands comprise old alluvium which has undergone considerable change through the influence of varying drainage conditions, while the first bottoms consist of recent alluvium and are still subject to overflow. The loessial soils prevail over most of the area. Seventeen soil types representing 14 series are mapped. Ruston fine sandy loam, Grenada silt loam, and Ruston very fine sandy loam, occupying 40.3, 20.4, and 12.6 per cent of the total area, respectively, predominate.

**Soil survey of Callaway County, Mo.**, H. H. KRUSEKOPF, J. H. AGEE, and R. H. HALL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the Agricultural Experiment Station of Missouri, deals with the soils of an area of 517,120 acres situated in the central part of the State and on the north side of the Missouri

River. Approximately the northern half of the county is comprised of glacial plains characterized by level prairies and gently rolling areas, while the southern portion consists of timbered, rolling to hilly uplands representative of the Ozark region. In general, natural drainage is well established.

The upland soils of the county are glacial, loessial, and residual in origin, with the first two predominating in the northern part and the last in the southern part of the county. Gray soils with heavy subsoils characterize the region generally. Areas of alluvial soil also occur. In addition to rough stony land, 21 soil types of 16 series are mapped. Putnam silt loam, Lindley silt loam, and Union silt loam predominate, occupying 41.8, 19.2, and 12 per cent of the total area, respectively.

**Soil survey of Oswego County, N. Y.**, C. N. Mooney, E. T. Maxon, R. J. Morgan, and J. H. Bromley (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 43, fig. 1, map 1*).—This survey, made in cooperation with the New York State College of Agriculture, deals with the soils of an area of 606,720 acres situated in the north-central part of the State at the eastern end of Lake Ontario. The topography varies from undulating to hilly with a range in elevation of from 246 to 1,750 ft. above sea level. Except in certain boggy and swampy areas in the central and eastern part of the county, natural drainage is generally adequate.

The soils of the region consist of glacial till derived chiefly from sandstone and sandy shale and comprise glacial drift, water-deposited, and cumulose material. In addition to muck, meadow, and beach sand, 18 soil types of 8 series are mapped. Worth stony fine sandy loam, including the poorly drained phase, occupying 37.1 per cent of the total area, is the largest single type.

**Soil survey of Benton County, Wash.**, A. E. Kocher and A. T. Strahorn (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 72, pls. 3, figs. 2, map 1*).—This survey deals with the soils of an area of 1,100,800 acres situated in the southeastern part of the State and separated from the State of Oregon by the Columbia River, which also bounds the county on the north, east, and south. The elevations range from 240 ft. above sea level in the river valleys to 3,500 ft. in the Rattlesnake Hills and Yakima Range. Rather extensive areas in the Columbia River Plains lack adequate natural drainage.

Benton County lies wholly within the Northwest Intermountain soil province, and is underlain by a succession of basaltic sheets of the Columbia River lava, which has entered little into the formation of the soils. The soils of the region have been derived from loessial, eolian, old valley filling, and stream-laid material. In addition to scabland, dunesand, and riverwash, 26 soil types of 12 series are mapped. Ritzville loam and Sagemoor silt loam, occupying 30.9 and 10.7 per cent of the total area, respectively, are the prevailing types.

**[Cultivation and soil moisture]**, M. Ringelmann (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 27, pp. 746–748; abs. in Rev. Sci. [Paris], 57 (1919), No. 9, pp. 280, 281*).—This article discusses briefly the relation of plowing to the water content of soils. According to the author's tests the best results with the least expenditure of energy will be obtained in plowing when the soil contains from 11 to 17 per cent of moisture, depending upon the physical character of the soil. This necessarily narrowly limits the time in which plowing can be most effectively done, and hence increases the value of tractors in expediting the work.

It was found that traction increases with decrease of moisture in the soil. With 15.4 per cent of moisture in the soil, the traction per square decimeter was 47.4 kg., with 11.1 per cent of moisture, 46.1 kg.; with 5.1 per cent of moisture 70.7 kg.; and with 3.8 per cent of moisture 78.2 kg.

**The washed lands of Indiana: A preliminary study**, M. L. FISHER (*Indiana Sta. Circ. 90 (1919), pp. 24, figs. 18*).—The nature and causes of soil erosion in the State are discussed and various methods for its prevention and for reclaiming washed areas are briefly described. The principal preventive measures are said to comprise strip farming, mulching the brow of steep slopes, skip plowing, diverting the run-off, and keeping the land in permanent vegetation; while the recovery of badly eroded land includes filling in the gullies with straw, cornstalks, weeds, brush, tree tops, logs, and trees; the seeding of alfalfa or other hay and pasture plants or the growing of wheat or corn; and liming and preparing the seed bed for grasses, particularly redtop and Kentucky blue grass, on denuded surfaces.

**[Report of soil work in Georgia]** (*Georgia Sta. Rpts. 1917–18, pp. 15, 16*).—Continuing observations previously noted (E. S. R., 37, p. 23), it is stated that the rapid increase in numbers of bacteria in soil receiving stable manure, sterilized manure, or green manure persisted for several months, and was due largely to the addition of fermentable material. A study of bacteria picked from plates inoculated with variously treated soils is held to show that the increase in numbers was due to the multiplication of small sporeless forms, with but little increase in the number of Actinomyces. A large number of gas-producing forms are said to have followed the addition of sterilized manure, but to have disappeared in two or three weeks.

A strain of *Bacillus radicicola* isolated from vetch and at that time unable to inoculate alfalfa is said to have acquired this power after growing with alfalfa meal in heated soil for two years. The same strain grown on nitrogen-poor agar for two years remained specific for vetch. Soy beans and velvet beans were found to be inoculated with the same strain of *B. radicicola*. Most of the native legumes appeared to be well inoculated, while redbud (*Cercis canadensis*), wild coffee bean (*Cassia tora*), honey locust (*Gleditsia triacanthos*), and mimosa, although abundant and well established in the State, are said to be entirely lacking in nodule formation.

**[Report of soils work at the Delaware Experiment Station, 1918]**, T. F. MANNS (*Delaware Sta. Bul. 122 (1918), pp. 28, 29*).—Observations on crop yields and changes in the bacterial flora in 10 different types of soil subjected to various fertilizer, lime, and manurial treatments in a continuation of similar work previously noted (E. S. R., 39, p. 116), are held to indicate that applications of manure, phosphorus, and lime have resulted in the highest crop yields on most of the soils, and that additions of manure produced the greatest changes in the soil flora.

**Results of fertilizer experiments in Arkansas**, DEF. HUNGERFORD (*Arkansas Sta. Bul. 155 (1918), pp. 3–27, figs. 4*).—Fertilizer experiments with cotton and corn begun in 1909 and conducted for different lengths of time at the station, on outlying experiment fields, and in cooperation with farmers and district agricultural schools in the State are reported on in some detail, the more important results having already been noted from another source (E. S. R., 39, p. 21).

Nitrogenous fertilizers such as nitrate of soda, cottonseed meal, and barnyard manure produced decided increases in crop yields in most of the experiments, while both acid and rock phosphate used in conjunction with them also proved to be beneficial. Acid phosphate used alone was not profitable except where the soil had been previously well manured or where legumes had been plowed under. Ground limestone gave profitable returns in practically every instance.

**Soil test experiment at Aroostook farm [1918]**, C. D. WOODS (*Maine Sta. Bul. 278 (1919), pp. 33–56, figs. 3*).—This describes the progress of soil fertility

work on Caribou loam on Aroostook farm (E. S. R., 39, p. 327). Clover yields are said to have been too uneven to justify any conclusions, while the following tentative deductions with regard to oats and potatoes are presented: Nitrogen appears to be the limiting factor on this soil for both oats and potatoes. Neither phosphoric acid nor potash affected the yields of oat grain. Small amounts of potash increased the yield of potatoes, while phosphoric acid had no effect.

**[The progress of soil investigations in India, 1917–18]** (*Rpt. Prog. Agr. India, 1917–18, pp. 66–73, 101–104*).—Soil fertility investigations conducted in various parts of India are rather briefly summarized.

**Some notes on manures in southern India**, W H. HARRISON (*Madras Agr. Dept. Yearbook, 1918, pp. 52–66*).—It is noted that the fertilizer resources of this region are limited. Small amounts of lime and gypsum are available. The supply of branyard manure is limited and poor. A certain amount of Trichinopoly phosphates, oil cakes, and fish manures can be had.

**The influence of farmyard manure on the clover crop**, E. J. RUSSELL (*Jour. Bd. Agr. [London], 26 (1919), No. 2, pp. 124–130*).—Results of experiments at Rothamsted, the Ohio Experiment Station, and elsewhere are cited to show that "farmyard manure may have an important residual effect on clover which should be taken into account in estimating its effect on the rotation." In all of the cases cited except one, manure was more effective than other fertilizers in increasing the growth of clover in rotations with other crops.

**[American peat industry in 1918]** (*U. S. Geol. Survey Press Bul. 412 (1919), p. 2*).—The production of crude peat in 1918 was 151,521 short tons as compared with 97,363 tons in 1917. The amount of refined peat marketed was 107,261 tons worth $1,049,493. Of this amount 79,573 tons was used for fertilizer purposes, 7,096 in the manufacture of stock food, 20,567 for fuel, and 25 tons for miscellaneous purposes. The increase during the year in the use of peat for fuel was especially noteworthy. The total number of plants engaged in commercial production of peat was 25. New York and New Jersey had 4 plants each, Massachusetts 3, Georgia, Illinois, Indiana, and California, 2 each, and Maine, New Hampshire, Connecticut, Pennsylvania, North Carolina, and Florida 1 each.

**The Bucher cyanid process for the fixation of nitrogen**, E. POSNJAK and H. E. MERWIN (*Jour. Wash. Acad. Sci., 9 (1919), No. 2, pp. 28–30; abs. in Sci. Abs., Sect. B—Elect. Engin., 22 (1919), No. 255, p. 90*).—In the investigations here briefly reported, "it was found by means of microscopical examinations that the nitrogen-bearing constituent of some of the crude technical products manufactured by this process [i. e., heating a mixture of sodium carbonate, charcoal, and iron powder in a stream of nitrogen at a temperature above 900°] consisted principally of some other substance than ordinary sodium cyanid."

**The question of phosphatic fertilizers**, E. MIÈGE (*Rev. Sci. [Paris], 57 (1919), No. 7, pp. 202–210*).—Investigations relating to physical, chemical, and biological methods of making phosphates available as plant food are quite fully reviewed with numerous references to literature, including the recent American work of Lipman, McLean, Brown, and others on the action of sulphur and bacteria in rendering mineral phosphates available, and the fertilizing value of the products obtained by various methods is discussed. The author considers the American work of great interest and practical significance and promise.

**Phosphatic nodules of Trichinopoly and their availability as manure**, M. R. RAMASWAMI SIVAN (*Madras Agr. Dept. Yearbook, 1918, pp. 34–51, pls. 2, figs. 4*).—The results of a Government survey of the district in which the phosphate is found are reviewed and the phosphatic nodules are described. An analysis is

reported which showed 55.95 per cent of tricalcium phosphate, 2.44 per cent of magnesium carbonate, and 7.1 per cent of iron oxid and aluminum. Since the phosphates are evidently not suited to the manufacture of superphosphate it has been recommended that they be used in fine ground condition. They are being tested in this form as fertilizer for rice.

**Analyses of inspection samples of fertilizers, 1917,** J. T. WILLARD, C. O. SWANSON, and R. C. WILEY (*Kansas Sta. Insp. Circ. 7 (1918), pp. 16*).—This reports the results of the actual and guarantied analyses of official samples of commercial fertilizers and fertilizing materials collected during 1917.

## AGRICULTURAL BOTANY.

**Report of plant physiologist,** E. M. R. LAMKEY (*Delaware Sta. Bul. 122 (1918), pp. 30, 31*).—A summary is given of investigations carried on in changing permeability and its relation to availability and the reactions of enzyms to solutions within the plant. Work on these projects has not progressed very far, but preliminary investigation has shown the necessity of considering temperature, shade, sunlight, and moisture content of the soil in conjunction with the permeability of the tissues and the availability of plant food. It has been found that peach tissues may be equally permeable to certain salts under one system of management while under another system they will be unequally permeable. In the study of the reactions of enzyms, the author has designed and used apparatus for the determination of peroxidase and oxidase activities under known and controlled conditions. By use of the methods devised by him, the peroxidizing, oxidizing, diastatic, and inverting enzyms of variously fertilized trees have been studied throughout a single season.

**Growth in organisms,** D. T. MACDOUGAL (*Science, n. ser., 49 (1919), No. 1278, pp. 599–605*) —In an address before the Pacific Division of the American Association for the Advancement of Science, the author discussed growth as based on the conception that living matter is composed mainly of pentosans and albumins or albumin derivatives with lipins as a minor component and that growth of living matter consists of hydration with accompanying swelling and of accretion of solid matter, the two processes being actually independent. Enlargement of cells is considered almost entirely due to the swelling which results from hydration in their earlier stages, and later the enlargement of the syneretic cavities in the colloidal structure is followed by the distending or stretching action of osmotic pressures in the vacuoles thus formed.

**Root growth in desert plants and the oxygen supply of the soil,** W. A. CANNON (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 81–83*).—It is said that roots of Prosopis continue growth for a longer time in a soil atmosphere poor in oxygen, with no carbon dioxid, than is the case with Opuntia. The oxygen, as well as the carbon dioxid, response thus appears to be specific, at least as far as these two plants are concerned, and is thought, therefore, to be a matter of ecological importance. The relative indifference of the roots of Prosopis to soil aeration permits either deep or shallow growth and enables the species to range widely as regards soils, while the relative dependence of the roots of *O. versicolor* on good soil aeration prevents their striking to any considerable depth and also excludes the species from soils of fine texture.

**Root absorption from solutions at minimum concentrations,** R. B. HARVEY and R. H. TRUE (*Amer. Jour. Bot., 5 (1918), No. 10, pp. 516–521, figs. 2*).—Following up the studies of True and Bartlett (E. S. R., 34, p. 224) with investigations of equilibrium points as regards gain or loss of electrolytes by plants, the authors found that in case of squash, peanut, soy bean, and sweet corn

growing in water culture the equilibrium concentration was specific for each plant. It is stated that if the concentration is below that which is toxic for the plant, yet meets growth requirement thereof, the equilibrium concentration value is independent of the kind of nutrient salt used, the concentration of the electrolyte, or the volume of the solution.

At the point of equilibrium between the plant and the solution, the electrolyte content of the solution is determined (1) by certain factors which are constant for different plants under the same conditions, such as carbon dioxid equilibrium with the air, and (2) by the rate of cleavage of ion-producing compounds of the cell and reabsorption of the ions produced.

**The influence of certain added solids upon the composition and efficiency of Knop's nutrient solution,** E. H. Toole and W. E. Tottingham (*Amer. Jour. Bot., 5 (1918), No. 9, pp. 452–461*).—Results of experimental tests regarding the effects upon the physiological balance of a nutrient solution produced by adding solids offering relatively large surface to the action of solvents and solutes are given.

The authors state that when barley and pea plants were grown for 21 days in Knop's nutrient solution plus ferric hydrate, silicic acid, and carbon black, each upon two planes of application, it was found that the first increased the dry weight of the barley tops about 50 per cent, the second had no effect, and the third depressed growth appreciably. The weight and the length of the roots were not markedly affected in any case. The dry weights of barley tops were inversely proportional to the hydrogen-ion concentration of the solution, but the total range in the acidity of the cultures was comparatively small. In all cases the growing barley plants exerted a neutralizing effect upon the reaction of the solution. Over 90 per cent of the phosphorus of Knop's solution was removed by the higher application of ferric hydrate, presumably owing to the formation of insoluble ferric phosphate. This culture was by far the best, as regards both appearance and yield. Treatment with ferric hydrate (producing neutrality of the nutrient medium) may have contributed to the higher yield. No clear evidence was obtained regarding adsorption of nutrient ions.

**A simple method of demonstrating the production of aldehyde by chlorophyll and by anilin dyes in the presence of sunlight,** W. J. V. Osterhout (*Amer. Jour. Bot., 5 (1918), No. 10, pp. 511–513*).—A method is described by which relatively large quantities of aldehyde free from contamination by nonvolatile substances is obtained in sunlight from chlorophyll or from certain anilin dyes.

**The origin and physical basis of succulence in plants,** D. T. MacDougal and H. A. Spoehr (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 85, 86*).—The discovery that Castilleja and Erigeron each included some individuals which were thick leafed and some which were thin leafed, and that these leaf characters were correlated with water supply, has furnished a starting point for the study of succulence. An analysis of the carbohydrates of desert plants has shown that when cells containing polysaccharids undergo depletion of water content these sugars are reduced to the pentosans, of which the mucilages are largely composed. This and other facts lead to the conclusion that aridity, by causing undue loss of water, induces a change in the cell by which the amount of water it may hold is greatly increased. This results in giving the cell mass a storage capacity which is permanent, as the pentosans are not reconvertible into the polysaccharids. The change from a thin-leafed condition to that of succulence is not a simple one, and it appears that the resulting biocolloidal complex of the succulent leaf has taken on new characters.

**The index of transpiring power of plants**, E. B. SHREVE (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 72–74*).—Having noted previously (E. S. R., 40, p. 27) a large opening for error in the assumption that the tripartite cobalt paper slips for determining index of transpiring power are at the same temperature as the surrounding air, the author has employed an adaptation of the thermocouple referred to below to test the temperature of the cobalt paper slip as it rests upon the leaf under its grass cover. This work has established the fact that the temperature of the air may be safely taken as the temperature of the cobalt slip. It is also shown that if cobalt slips are standardized at within 2 or 3° of 20° C., the error introduced is smaller than that obtained from consecutive readings on the same slip at any given temperature.

**Modification of root habits by experimental means**, W. A. CANNON (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 83–85*).—These observations appear to show that roots which penetrate deeply, or which ordinarily grow in soils of fine texture, are less responsive to relatively small changes in soil aeration and may be less dependent on temperature than is the case with roots which are essentially superficial and which occur only in relatively well-drained soils. Exceptions are noted. Cultural experiments with species whose roots remain close to the surface and which have well-fixed characters show a surprising plasticity in root development. It is claimed that in certain cacti the distinctive root characters do not result from inherited tendencies, but are probably expressions of the response of the species to the distinctive aeration and temperature conditions of the soil environment.

**Water content and abscission in the nuts of Juglans californica quercina**, F. E. LLOYD (*Carnegie Inst. Washington Year Book, 17 (1918), p. 76*).—A record having been kept on numerous fruits of *J. californica quercina* of such as ultimately became separated from the twig by abscission, it is stated that a daily net gain was made which decreased until an uncompensated loss occurred. Inadequate water supply is thought to be the exciting cause of abscission, which closely resembles that occurring in the cotton plant (Gossypium).

**Calcium oxalate in the dasheen**, O. F. BLACK (*Amer. Jour. Bot., 5 (1918), No. 9, pp. 447–451*).—Investigation of tubers and leaves of the dasheen is considered to show that the calcium oxalate crystals are the sole cause of the acrid taste, which is supposed to be due directly to mechanical irritation by the needles coming in contact with the mucous membrane of the mouth. It is stated that proper cooking will remove the crystals and render the plant useful as a vegetable.

**Sterility and self and cross incompatibility in shepherd's purse**, G. H. SHULL (*Abs. in Science, n. ser., 49 (1919), No. 1275, p. 547*).—An abstract is given of a paper read before the American Philosophical Society in which the author describes the result of crossing the common shepherd's purse of the eastern United States with a form that occurs on the Pacific coast. The form from eastern America is characterized by sterility of the lower flowers of the main axis, while the western species does not show this condition. As a result of study of the crosses made, there was found to be a rhythmatic succession of sterile and fertile flowers, and there seemed to be some evidence that this arrangement was under the control of two genetic factors.

**Culture of a potato hybrid, Solanum fendleri×S. tuberosum ("Salinas")**, D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 87, 88*).—Cultures of the hybrid between the wild potato of Arizona and the domestic variety have been carried on at the Coastal Laboratory and on a ranch in the Carmel River Valley, resulting in the separation of a number of elements of different value. Studies are being made on about a dozen strains of possible economic importance.

**Uredinales of Guatemala based on collections by E. W. D. Holway, II–IV,** J. C. ARTHUR (*Amer. Jour. Bot., 5 (1918), Nos. 8, pp. 420–446; 9, pp. 462–489; 10, pp. 522–550*).—The present series, which is consecutive with the contribution previously noted (E. S. R., 40, p. 327), deals with the Æcidiacaæ (Pucciniaceæ), some genera having been placed out of their usual order to express the author's conception of their affinities.

## FIELD CROPS.

**The influence of crop plants on those which follow, II,** B. L. HARTWELL, F. R. PEMBER, and G. E. MERKLE (*Rhode Island Sta. Bul. 176 (1919), pp. 4–48, figs. 7*).—Supplementing experimental work conducted in the field (E. S. R., 40, p. 623), pot experiments begun in 1911 are described in which further observations were made on the effect of different crops on those grown subsequently. The investigations were divided into two parts, one conducted in Wiley pots in the greenhouse to study the effect of onions, buckwheat, rye, and redtop on onions and buckwheat when grown with an optimum supply of nutrients; with nitrogen, phosphorus, and potassium each omitted; and with half more than the optimum supply of nutrients; and the other made in ash cans sunk in the ground out of doors in which observations were made on the effect of onions, buckwheat, rye, redtop, and mangels on onions and buckwheat when the crops were grown with different amounts of nitrogen. Applications of lime were made to all pots at the beginning of the experiment and again 3 or 4 years later. Data showing the crop yields and the amount of nutrients removed in the different crops are presented in tabular form with full discussion and may be summarized as follows:

When onions were grown after the different crops had occupied the soil 2 or 3 successive seasons, the yields increased after the crops in about the following order: Buckwheat, mangels, rye, onions, and redtop. When buckwheat was grown uniformly, the yield increased in order after redtop, buckwheat, mangels, rye, and onions. With the different fertilizer treatments the relative effect of the several crops varied somewhat, depending upon the treatment, but not so much as generally expected. Chemical analyses of the crops are held to indicate that changes in the percentage composition of a crop brought about by a given application of a nutrient depended not only upon its effect upon the rate of growth but also upon the abundance of the other nutrients in relation to the needs of the crop. In general it appeared that the nutrients actually required for the normal growth of the crops need not exceed in dry material 2 per cent nitrogen, 1.5 per cent potassium oxid, and 0.5 per cent phosphoric oxid, providing an adequate supply of other ingredients is available to furnish the indifferent ash. As indicated by the field experiments, "the divergent effect of crops on those which follow seems not to be attributable, at least principally, to differences in the amount of nutrients removed by the crops grown previously—that is, the smallest yield may not occur after the crop which removed the largest amount of even the most-needed nutrient."

The soil acidity was affected differently by the various crops. Onions, said to be sensitive to conditions accompanying acidity, showed the best yields after crops giving rise to the least acidity. The effects of the crops on those which followed were observed to be much less divergent when the soil acidity was reduced by liming. Even the preceding crop effects may prove to be relatively unimportant on neutralized soil. It is suggested that for practical purposes the potent influences observed in these investigations should receive careful attention, since many soils exhibit a higher degree of acidity than existed in the

experimental soil and it is regarded as doubtful whether they would ever be limed sufficiently to maintain them in a neutral condition.

[Crop rotations for northeastern Ohio], C. W. MONTGOMERY (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 117–120, fig. 1*).—Results secured on the Northeastern Test Farm, Cuyahoga County, with 3- and 5-year rotations for the period of 1915 to 1918, inclusive, together with a study of crop costs and net receipts per acre in the 5-year rotation for 1917 and 1918, have led to the conclusion that under present conditions a rotation of corn, oats, wheat, and clover would be most profitable in a majority of cases for this section of the State. It is suggested that the fertilizer treatment comprise an application of 6 tons of phosphated manure on the corn, 160 lbs. of acid phosphate on the wheat with 4 tons of phosphated manure as a top-dressing, and 2 tons of ground limestone applied before either the corn or the wheat. A mixture of 5 lbs. of red clover and 3 lbs. each of alsike clover and alfalfa is recommended for seeding with the wheat.

[Report of field crops work at the Delaware Experiment Station, 1918], A. E. GRANTHAM (*Delaware Sta. Bul. 122 (1918), pp. 10–20.*)—This describes the progress of soil and crop investigations in continuation of similar work previously noted (E. S. R., 39, p. 127).

Observations on the effect of commercial fertilizers, green manure, and stable manure used with and without lime in a rotation of corn, soy beans, wheat, and clover showed marked results from liming, the hay yield being increased nearly 40 per cent and the corn yields from 6 to 8 bu. per acre over the untreated or unlimed areas. Wheat did not respond readily to liming, while soy beans made a more vigorous growth of vines where lime was applied. Liming also appeared to hasten the maturity of corn. Little effect from the use of lime was noted on wheat and corn grown continuously.

With regard to the application of single plant food elements, phosphorus exerted a marked effect on wheat during the earlier years of the experiment, while later potash appeared to be more important. Wheat receiving phosphorus ripened from 3 to 5 days earlier than when it was omitted. Phosphorus and potassium in combination gave the greatest net profit per acre. Commercial nitrogen applied in conjunction with phosphorus and potassium failed to show any consistent profit with either wheat or corn. Potassium proved to be the most important element for both corn and soy beans. The number of nodules on the roots of the soy beans was found to be considerably greater where potash was used than with any other fertilizer treatment. Potash also effected the fullest development of the ear and grain in corn.

A number of crop rotation experiments were begun in 1910 to study the value of green manures for maintaining crop yields. The principal crops in the rotations were corn, wheat, potatoes, red clover, timothy, winter oats, and soy beans, while the green manure crops included crimson clover, red clover, vetch, rye, and cowpeas. Except on the potato crop only green manure and mineral fertilizers other than nitrogen were used. The results secured indicate that red clover requires considerable potash for the best results. Corn produced much better in rotation with red clover than in rotation with soy beans and timothy, the difference amounting to as much as 25 bu. per acre. Soy beans were found to exhaust the soil to a marked extent. Wheat after soy beans gave good results, but the best wheat yields were secured after potatoes. The corn yields obtained in a rotation of corn, wheat, and alfalfa two years were larger than where 700 lbs. of commercial fertilizer was used in a rotation of corn, soy beans, wheat, and red clover, while the wheat yields averaged about 30 bu. per acre.

Observations on the relative value of various forms of lime and phosphorus in maintaining soil fertility are held to indicate that carbonate of lime is practically as efficient as the burned forms of lime for correcting soil acidity; that raw rock phosphate can be used to fair advantage when employed in rotations where considerable amounts of organic matter are turned under; that lime alone has not resulted in a better stand of clover; that phosphorus carriers vary to a marked extent in their effect on the crop, their value decreasing in the following order: Acid phosphate, basic slag, sodium phosphate, bone meal, and raw rock phosphate; that with applications of raw rock phosphate wheat yields have increased as the experiment progressed; and that high magnesium lime has given as good results as high calcium lime.

Extensive variety tests with wheat have been described elsewhere (E. S. R., 41, p. 39), the results for the past year corresponding very closely with those of the previous tests. A study of the performance of different varieties and types of wheat grown under various fertilizer treatments, ranging from many times the optimum requirements of the plant to the minimum quantity of plant food required for a 25-bu. yield, is noted. The results indicate that the amount of potash taken up during growth and the proportion of phosphorus, potassium, and calcium vary somewhat with the different varieties.

Johnson County White corn is deemed to be best for Delaware conditions, in many cases producing more than 100 bu. per acre. Reid Yellow Dent and Leaming appeared to be the best yellow sorts, although they yielded from 8 to 10 bu. per acre less than Johnson County White. Observations on seed of hybrid origin, as compared with pure seed, indicated that the former outyielded the latter on both poor and fertile soil. Smooth ears of Johnson County White also gave better results than rough ears on poor land, there being little difference when the two were planted on fertile soil. A study of the effect of variations in the physical characters and the chemical composition of the kernel on the vigor and yield of the plant has not as yet revealed any wide differences in yield from corn of different physical characters when grown under good environmental conditions, although noticeable differences in the degree of vigor of the plant were observed under slightly unfavorable circumstances. The study has also shown a wide range in the physical characters of ears in the same variety.

Silver Mine and Swedish Select Oats have given somewhat better results than the other varieties of spring oats tested, although the crop in general is regarded as unprofitable. Limited tests with winter oats are said to have given promising results.

The Wilson, Peking, and related strains of soy beans are deemed best for general farm purposes, while Cloud is said to be one of the best varieties for hay.

[Report of field crops work in Hawaii, 1918], F. G. Krauss, C. A. Sahr, and R. A. Goff (*Hawaii Sta. Rpt. 1918, pp. 33, 45–51, 51–53, fig. 1*).—This describes the continuation of work previously noted (E. S. R., 38, pp. 826, 827, 828).

In a comparative test of the relative resistance to blight of three standard varieties of potatoes and of the new Hamakua Hybrid made at the forage crop station near Castner (Oahu), Early Rose and Burbank succumbed about 11 weeks after planting and Portuguese Purple and Hamakua Hybrid about 3 weeks later.

Kukiruki and Okabu rice grown in rotation with taro at Waiau (Oahu) produced increases in yield favoring rotation which amounted to 872 and 944 lbs. per acre, representing 17 and 17.7 per cent, respectively.

Work with corn consisted chiefly of testing different varieties for resistance to the leaf hopper (*Peregrinus maidis*). Native Guam corn received from

the Guam Experiment Station is said to have shown considerable resistance. Several standard varieties of corn received from the Bureau of Plant Industry, U. S. Department of Agriculture, failed to produce any grain, while certain other varieties varied in yield from 10.9 bu. per acre of shelled corn for Northwestern Dent to 39.2 bu. for Creole, as compared with 46.7 bu. for Native Guam. Cuban Red, introduced by the College of Hawaii, also showed marked resistance to leaf-hopper attack but possessed somewhat inferior drought-resistant qualities.

Of six varieties of button clover tested, *Medicago scutellata* and *M. orbicularis* alone made promising growth. *M. scutellata*, although attaining considerable size, was killed off by aphids, while *M. orbicularis* gave the best results when the trailing stems were supported and partially shaded by Bermuda grass. Plantings of annual types of white sweet clover, received from the U. S. Department of Agriculture and from the Iowa Experiment Station, have made favorable growth. Duplicate plantings of so-called Prolifikeeno grass received from Fabens, Tex., produced at the rate of 15.35 tons of green forage per acre from 55 to 60 days after planting. It is said to resemble Johnson grass closely in the appearance of underground suckers shortly after cutting.

In fertilizer and manurial experiments with edible canna (*Canna edulis*) the maximum yield of tubers, 42.83 tons per acre, followed an application of 250 pounds each of ammonium sulphate, superphosphate, and sulphate of potash, as compared with a yield of 28.43 tons from the check. Observations on the utilization of spherical and cylindrical types of tubers for sets resulted in yields amounting to 32.02 and 37.13 tons per acre, respectively.

Further observations of the effect on the yields of different forage crops of soil heating and manuring at Castner again demonstrated the high value of stable manure on manganese soils, crop yields being considerably increased over all other methods of handling. Spraying Peruvian alfalfa with copperas the first and second week after each cutting resulted in increases in yield in the succeeding cuttings ranging from 4.9 to 228.4 per cent over the unsprayed crop. Japanese cane sprayed every 2 weeks for a period of 6 months showed an increase in yield of 43.5 per cent when harvested 6 months after the spraying was discontinued. Spraying alfalfa with copperas and fertilizer compounds, including lime, sulphate of potash, and superphosphate, resulted in decided increases in yield in almost every case over drilling in the fertilizer.

Hill selection of potatoes both to increase the yield and to secure a blight-resistant type at the Haiku (Maui) substation is said to have given some success. Dibble Russett produced 180 bu. of marketable tubers as compared with 100 bu. from unselected seed. The potato industry is reported to be increasingly affected by the potato mite. Lime-sulphur spray or sulphur alone has proved to be an effective remedy.

Work with alfalfa on the Glenwood (Hawaii) substation indicates that seeding may be done in the field instead of in seed plats or nursery seed beds, as was formerly deemed essential to successful alfalfa production, providing care is exercised to plant when cutworms are not plentiful. In variety tests with potatoes, yields have been secured amounting to from 35.7 bags (100 lbs. each) per acre for Vermont Gold Coin to 108 bags for Hamakua Hybrid (light variety). In an effort to develop a fiber industry for areas near Glenwood which can not be used for sugar-cane production, trials have been made with sisal, New Zealand flax, hemp, flax, and Manila hemp, all but the last giving some promise for the future.

[Report of field crops work in New Mexico, 1917–18] (*New Mexico Sta. Rpt. 1918, pp. 27–29, 32, 33, 44–47, figs. 3*).—The progress of work previously noted (E. S. R., 38, p. 633) is briefly described, including observations on

Johnson grass eradication; irrigation experiments with alfalfa; irrigation, cultural, and manurial tests with potatoes; and trials with Giant Russian sunflowers for forage.

Medium deep plowing on soils free from an excess of moisture is said to have resulted in a material decrease in the stand of Johnson grass, while plowing wet soil served to stimulate it. San Luis Valley peas and wheat gave good results as smother crops.

Giant Russian sunflowers seeded in rows and cultivated the same as corn produced at the rate of 25 tons of silage per acre when cut in full bloom. It is stated that the crop is of doubtful value as a seed crop owing to ravages from birds.

The alfalfa plats receiving 5-in. applications of water and cultivated once after each irrigation produced the heaviest yields in 1917, followed closely by plats seeded broadcast receiving the same amount of water. Two-in. applications produced the greatest amount of hay per inch of water, 333 lbs., as compared with 285.7 lbs. for the 5-in. application. Observations made in root penetration again indicated that alfalfa roots increase in length with an increase in the amount of water applied.

A tabular statement is presented showing the potato yields for individual plats, together with a diagram of the plat arrangement and a graphic representation of the results secured during 1918. Plats receiving no winter irrigation but 1, 2, and 3 summer irrigations produced at the rate of 2,006, 3,178, 3,644, and 2,396 lbs. per acre, respectively, while those receiving winter irrigations totaling 5 and 10 in., respectively, produced 2,512 and 3,585 lbs. of potatoes as ccompared with 2,709 lbs. for no winter irrigation. In a similar manner, plats receiving no summer irrigation and 1, 2, and 3 irrigations during the summer produced 2,372, 2,265, 4,115, and 3,791 lbs., respectively. In a comparison of level, ridge, and Greeley cultivation respective yields of 3,388, 3,172, and 1,967 lbs. per acre were obtained. Stable manure applied in 1916 resulted in a yield of 3,259 lbs. in 1918, as compared with 2,942 lbs. for the unmanured plats.

[Report of field crops work in North Dakota] (*North Dakota Sta. Rpt. 1917, pp. 5, 6, 9, 10, 12–14, 16*).—In the tests here reported, Minnesota No. 13, Rustlers White Dent, and Mercer corn produced the largest yield of silage. Seed harvested in the glazed stage gave about as good a stand and yield as ripe seed, while that harvested in the dough and milk stages produced a fair stand but low yields. Manuring appeared to hasten maturity in corn, while corn grown in rotation with clover is said to have been of better quality than that grown in rotation with timothy.

Where wheat has been grown continuously for 30 years the soil was found to contain from one-fourth to one-third less nitrogen and one-fifth less phosphorus than virgin soil of the same type. For the last 8 years the wheat yield was 28 per cent less than for the first 8 years of the period. Manuring brome grass is said to have increased the yield of hay 72 per cent, together with a marked increase in the nitrogen and phosphorus content of the soil.

Clover proved to be more profitable in the rotation than timothy or peas, while alfalfa was also quite profitable. A rotation of corn, wheat, barley, clover, and wheat produced the maximum return, the average annual value of the crops produced from 1910 to 1916, inclusive, amounting to $24.49 per acre, as compared with $12.06 for wheat grown continuously.

One-ton applications of fresh and rotted manure resulted in average increases in the value of the crops of $1.13 and $1.22, respectively. In view of the loss from rotting and the extra labor involved the trial is held to indicate that it is more profitable to haul manure directly to the field than to compost it.

In a comparison of live stock and crop farming an application of manure and phosphorus produced a slight increase in the yield of corn, oats, and barley, while clover has failed to respond either to manure or fertilizer. Increased yields due to the use of mineral fertilizers have not yet been sufficient to cover their cost.

Medium red clover gave satisfactory results when sown at the rate of 5 lbs. per acre with northern-grown seed. *Melilotus alba* appeared to be unable to withstand wet conditions and flooding, being almost entirely killed where red clover survived. Cutting the first crop of sweet clover at different heights resulted in almost no second growth with a stubble of 4 in., a 50 per cent stand with the stubble left at 12 in., and a full stand with the stubble cut to 16 in. Observations on the preparation of silage from sweet clover and alfalfa are said to have led to encouraging results, an excellent grade of silage having been obtained under varying conditions, such as differences in maturity, length of curing, the addition of water, and admixture with other crops. Spoilage almost invariably occurred when the dry matter was less than 25 per cent. Good results were secured even with very dry material providing it was well cut and tightly packed.

A total of 5,933 samples of seeds were analyzed by the seed laboratory during the fiscal year, of which 2,776 were wheat. It was concluded that seed wheat more than a year old should be tested for viability unless it had been kept free from moisture effects during storage. Observations on wilt and canker-resistant strains of flax and on the influence of the imperfect fungi upon the seed and seedling of different crops are mentioned.

Fertilizing the corn crop, C. E. THORNE (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 99, 100, fig. 1*).—Briefly reviewing soil fertility work conducted at Wooster and on outlying experiment fields, it is advised that from 150 to 200 lbs. per acre of acid phosphate or steamed bone meal be applied to corn, "with the expectation that while the first year's increase may be small, the systematic repetition of the treatment will be profitable." It is recommended, further, that the fertilizer be applied broadcast, and not only in the hill or drill, in order that succeeding crops may benefit more fully from the unexhausted fertilizer residues.

Cultural experiments with cotton, 1918, W. E. AYRES (*Arkansas Sta. Bul. 161 (1919), pp. 3–14, pl. 1, figs. 4*).—This describes the continuation of work similar to that previously noted (E. S. R., 39, p. 739).

Planting cotton in check rows 3, 3.5, and 4 ft. apart, with the hills 36 in. apart in the row and with from 1 to 5 plants per hill, resulted in an average yield for 3 varieties of 1,182.8 lbs. of seed cotton per acre. The highest average yield, 1,232.1 lbs., was secured with 2 plants per hill. The 4-ft. rows gave better results than narrower rows, thought to be due to droughty conditions. A comparison of check-row spacing with ordinary spacing resulted in a total average yield of 1,089 lbs. from an average of 10,361 plants per acre for the former method of planting and 1,052.2 lbs. from 12,514 plants for the latter method.

Cotton seeded in drills in the usual manner and unthinned, seeded in hills 12 in. apart and thinned to 1 plant per hill, and seeded in hills 12 in. apart and left unthinned, produced at the rate of 1,036.2, 1,070.9, and 1,184.3 lbs. of seed cotton per acre, respectively. These results are held to indicate that profitable crops may be produced on the more fertile soils without thinning.

Seeding cotton in hills about 15 in. apart with one plant per hill resulted in a total average yield amounting to 1,115.9 lbs. of seed cotton per acre, as compared with 1,112.4 lbs. from a planting rate of 2 plants per hill with the hills about 30 in. apart. Varying the number of plants per hill in hills spaced 18 in. apart resulted in average yields ranging from 1,096.4 lbs. per acre for 1 plant

per hill to 1,323.5 lbs. for 5 plants per hill. Spacing cotton different distances in drill rows 3.5 ft. apart resulted in average yields ranging from 1,011.9 lbs. per acre for plants spaced 36 in. apart to 1,150.1 lbs. for those spaced 3 in. apart. Observations on spacing and time of thinning showed little difference in yield between 6 and 12 in. spacings, while late thinning (with the plants 10 to 12 in. high) produced only 984.6 lbs. of seed cotton per acre, as compared with 1,042.4 lbs. from early thinning. With the plants spaced at a constant distance in the row and with the rows 3, 3.5, and 4 ft. apart, yields of 1,071.2, 1,112.3, and 1,114.8 lbs. per acre, respectively, were secured. With a constant number of plants per acre (8,750), rows spaced 3, 4, 5, and 6 ft. apart, produced 1,264.7, 1,234.2, 1,299.2, and 1,235.5 lbs., respectively. It is stated that replanting with cotton where two-thirds of a stand was secured was not profitable, while replanting with corn practically ruined the cotton.

Planting cotton on ridges or beds resulted in a total average yield of 1,398.4 lbs. of seed cotton per acre, as compared with 1,236 lbs. for level planting.

In 1918 the best results were secured from plantings made the latter part of May, although as a general practice late planting is deemed undesirable. Little difference in yield was observed between deep and shallow cultivated plats. Tests on the value of topping cotton are noted, but the results are deemed inconclusive.

**Varieties of cotton, 1918.** W. E. AYRES (*Arkansas Sta. Bul. 159 (1919), pp. 16, fig. 1*).—This reports the continuation of work previously noted (E. S. R., 40, p. 437).

Of 109 varieties grown on small plats at the Scotts substation the three leading sorts both in total yield of lint and in value of seed and lint included Dixie, Lewis No. 63, and Toole, with 723.7, 629, and 618.6 lbs. of lint per acre, respectively. Experiments conducted at Scotts, Van Buren, Burdette, and Monticello with 25 standard varieties of cotton resulted in average returns per acre for seed and lint ranging from $137.74 for Webber 49 to $195.24 for Boykin 202. The average length of lint was from $\frac{1}{32}$ to $\frac{1}{8}$ in. below the 1917 average, thought to be due to adverse weather conditions. In a comparison of seed of promising strains from different sources, Lone Star 1, valued at $187.18 per acre, was first at Scotts, and Trice 1, with a total value of $165.54, first at Burdette. Boykin 202, Express 28–350, and Station Trice, tested on a field scale at Scotts, produced returns valued at $180.21, $170.78, and $145.04 per acre, respectively. Cooperative tests with farmers to study the local adaptation of promising varieties are also noted.

**The irrigation of oats,** F. S. HARRIS and D. W. PITTMAN (*Utah Sta. Bul. 167 (1919), pp. 3–20, figs. 15*).—Irrigation experiments with oats conducted during the period of 1916 to 1918, inclusive, on the Greenville experiment farm, are described in which observations were made on the effect of 5-in. irrigations applied at different stages of growth including the five-leaf, the early boot, the blooming, and the dough stages, respectively, together with weekly irrigations of either 1, 2.5, 5, or 7.5 in. beginning when the crop was 5 or 6 in. high and continuing until it began to turn yellow. During 1916 and 1917 three plats were manured at the rate of 5, 15, and 40 tons per acre, respectively, each plat also receiving an application of 2.5 in. of water. Natural precipitation during the years of the experiment averaged slightly more than 18 in. The results secured are depicted graphically and briefly discussed, and may be summarized as follows:

Of the plats irrigated weekly that receiving 5 in. per week for 6 weeks gave the highest average yield, 79.9 bu. per acre, this also being the maximum yield secured in the experiment. The next highest yield, 79 bu., was obtained with an application of only 15 in. of water applied in 5-in. increments at

the first three stages of growth. An average yield of 45.6 bu. per acre was secured without irrigation. Where only one irrigation was given the best results were secured from an application made at the five-leaf stage and where two irrigations were given at the five-leaf and boot stages. Where only one irrigation was omitted during the different stages of growth, that made at the dough stage was omitted to the best advantage. Omitting irrigations at either the bloom or the dough stage or both resulted in higher yields of grain than when applications of water were made at all four stages. In general the first irrigations were found to be of most value to the crop, and the second next in order. Applications of water made after seeding but before the grain was up decreased the yield.

The ratio of grain to straw, the height of the plant, the amount of tillering, the weight of the kernels, and the size of head were all affected by the irrigation treatment. Irrigation, especially at the later stages of growth, always retarded maturity. Small applications of manure increased the yield of both grain and straw, but large amounts caused excessive loss of grain through lodging. Twenty acre-in. of water spread over 4 acres of land produced more than three times as much grain as where it was all used on one acre. Under climatic conditions prevailing at Logan, the natural precipitation is said to have been sufficient to produce over 70 per cent of the maximum yield. Finally, these experiments are held to indicate that under the conditions described the best practice in irrigating oats is to make 3 applications of water of about 5 in. each, beginning when the plants are from 6 to 8 in. high and terminating with the blooming period.

**Potato studies, C. D. Woods (*Maine Sta. Bul. 277 (1919), pp. 17–32*).**—This bulletin comprises a discussion of the food value and mineral content of Maine grown potatoes, the utilization of potato pomace, ridge and level culture for potatoes previously noted (E. S. R., 25, p. 529), and a continuation of observations on nitrogenous fertilizers for potatoes on Aroostook farm and on the effect upon the potato crop of omitting potash fertilization (E. S. R., 39, p. 334).

A comparison of analyses of Maine grown potatoes with similar analyses of potatoes from other American sources is held to indicate that Maine potatoes contain approximately 1.5 per cent more dry matter than all other American potatoes. Spraying potatoes with Bordeaux mixture has resulted in an increase both in the yield of marketable tubers and in the starch content. Steaming potatoes appeared to have little effect on the composition of the dry matter. In feeding experiments with sheep in which raw and cooked potatoes were compared, the dry matter, organic matter, and the starch of the nitrogen-free extract were found to be somewhat more completely digested in the cooked than in the raw material. Similar tests with pigs resulted in a gain of 60 lbs. each in 44 days for pigs fed raw potatoes as compared with a gain of 67 lbs. for those fed steamed potatoes.

Based on the results of an analysis of the ash of Maine grown potatoes, it is estimated that a 250-bu. crop weighing 150 cwt. would remove 56 lbs. of ammonia, 20 lbs. of phosphoric acid, 72 lbs. of potash, and 1.5 lbs. of lime from the soil.

The composition of potato pomace, left as a residue from the manufacture of potato starch, is compared with that of potatoes and the conclusion reached that under present conditions its profitable utilization in this country is not possible.

Fertilizer tests begun in 1914 to determine the best source of nitrogen for potatoes in Aroostook County were discontinued with the 1918 experiments, the results of which confirmed the earlier findings. It is stated that there is apparently little choice in the form of nitrogen to be used on potatoes in this region, and it is suggested that in the fertilizer employed one-third of the nitrogen be

supplied from nitrate, one-third from ammonium sulphate, and one-third from high-grade organic matter.

Further observations on the omission of potash in fertilizer tests with potatoes begun on Aroostook farm in 1915 have led to the following conclusions: Good yields were secured without potash. The application of 300 lbs. of common salt per acre resulted in a small but uniform increase in yield over the untreated plat. The application of 45 lbs. of potash per acre (equivalent to 1,500 lbs. of 3 per cent goods) produced a uniform and profitable increase in yield on Caribou loam, while larger applications were not proportionately more profitable. Finally, nitrogen and not potash appeared to be the limiting factor in potato production on this soil.

**How to control potato enemies** (*Maine Sta. Doc. 535 (1918), pp. 16, fig. 1*).—Brief popular descriptions of the insects and diseases affecting potatoes and the nature of the injury produced by each are presented, together with recommendations for their control. Directions as to the time and manner of spraying and formulas for the preparation of insecticidal and fungicidal sprays are included.

**Fertilizer experiments with tobacco,** W. W. Garner and D. E. Brown (*Maryland Sta. Bul. 225 (1919), pp. 157–183, figs. 4*).—This bulletin describes rather extensive fertilizer tests with tobacco conducted in cooperation with the U. S. Department of Agriculture in Prince George County (southern Maryland). Observations were made on the effect upon the yield and quality of tobacco of applying different combinations and amounts of commercial fertilizers and on the use of lime. The results secured may be summarized as follows:

An analysis of the leaves and stalks of tobacco grown on the experiment field showed that a crop ranging from 1,300 to 1,600 lbs. per acre removed from the soil approximately 35 to 55 lbs. of nitrogen, 10 to 12 lbs. of phosphoric acid, and 55 to 70 lbs. of potash, about one-third of which was contained in the stalks and should be returned to the soil. Nitrogen appeared to be the limiting factor on these soils, inorganic forms such as nitrate of soda and sulphate of ammonia giving better yields than organic forms such as cottonseed meal and tankage, although the latter resulted in a better quality of tobacco than the former. Phosphates failed to increase the yield of tobacco but stimulated growth and promoted the proper ripening of the crop to a marked extent, resulting in a lighter color in the cured leaf. Wheat and other crops following tobacco showed a decided residual benefit from phosphate fertilizing. Potash gave only small increases in yield on "rested" land, while under continuous cropping to tobacco the soil showed a decided need of potash.

The proper ratio between the nitrogen and phosphoric acid in tobacco fertilizers is deemed to be most important, a nitrogen content amounting to from one-half to two-thirds of the phosphoric acid content being recommended for all except quite fertile soil or where a legume has been plowed under. For average soil conditions it is suggested that a fertilizer containing 4 or 5 per cent nitrogen, 8 per cent available phosphoric acid, and 4 per cent potash be applied at the rate of 600 lbs. per acre. Somewhat increased yields resulted from applying the fertilizer in the drill over broadcasting, while the crop also secured an earlier start and usually matured earlier.

Liming produced increased yields of tobacco only when nitrogen was not liberally supplied in the fertilizer through the liberation of nitrogen from the reserve supply in the soil. The darker color of tobacco following liming is said to be due to the excess nitrogen made available to the plant. It is suggested that lime, when used on tobacco soils, be applied to the crop immediately following tobacco in the rotation rather than to the tobacco crop itself.

Root-rot diseases of tobacco as a cause of uneven growth (especially on soil cropped continuously or too frequently to tobacco), late maturity, and reduced yields are briefly discussed in connection with investigations by Johnson (E. S. R., 36, p. 349). See also a previous note (E. S. R., 41, p. 39).

## HORTICULTURE.

**Adaptation in relation to hardiness,** M. J. Dorsey (*Minn. Hort., 46 (1918), No. 12, pp. 456–469, fig. 1*).—A contribution of the Minnesota Experiment Station, discussing seasonal response, or reaction, of varieties to growing condition as a basis for a clear understanding of what is ordinarily meant, in horticulture, by adaptation and hardiness.

Data are given on experiments conducted by J. C. Whitten at the Missouri Experiment Station and described to the author in a letter, which indicate that there is a fundamental distinction between a variety, or a clone, and a species in respect to differences brought about as a result of reaction or adaptation to their environment. In these experiments seed of native forest trees secured from the northern tier of States so far as possible and from each intervening State to Texas and the Gulf tier were sown at the Missouri Station over 20 years ago. The northern seed came up first generally. The seedlings from the extreme northern seed made far less height growth at first than those from seed obtained in the center of the natural distribution of the species. The northern seed produced trees which, for the first few years, took a much shorter growing period, starting later in the spring and shedding their leaves much earlier in the fall. Some of the seedlings from the South killed back to the ground the first season. The extreme southern seedlings had a relatively brief rest period, pushing out into growth with the first warm days of late winter or early spring and shedding their leaves very much later in the fall. At the end of 10 years practically all the specimens had reached a common habit of growth and seemed essentially equal in their hardiness.

Elberta and Old Mixon Free peach trees, propagated from Michigan and Ontario southward to the Gulf States, were planted out at the Missouri Experiment Station at 1 year of age. Whitten reports that "we have never been able to detect any differences in hardiness, in phenology, or in habit of growth or characteristics of these introduced trees. Evidently if there was any difference in the trees as propagated in these different States that difference was overcome by their first summer's growth here in the orchard."

In order to determine something of the season of maturity in Minnesota of plants from the southern and northern range of a species, 3-eye cuttings were obtained from the wild grape (*Vitis vulpina*) from Arkansas, Missouri, Iowa, and different sections of Minnesota. These were all planted in the same cold frame at the fruit breeding farm at Zumbra Heights. In the fall of 1916 the first killing frost killed the leaves completely on those from Arkansas and Missouri, while those from Iowa north were uninjured. Although the difference in frost resistance was striking, there was no marked difference in maturity between the several lots in the nursery bed, since the leaves were not green on each lot. The author also cites from the experience of Macoun, who found at the Central Farm, Ottawa, Canada, that with apples there is not only a relation between hardiness and early ripening of fruit, but also that in hardy varieties both fruit and wood ripen early.

**The field testing of copper-spray coatings,** J. R. Winston and H. R. Fulton (*U. S. Dept. Agr. Bul. 785 (1919), pp. 9, figs. 4*).—This bulletin describes a practical method of testing copper-spray coatings that has been used during two

seasons and has been found to be reasonably satisfactory in field practice. Some representative results secured in field trials are given, together with directions for using the method.

In making the test "a 200 gm. fresh weight sample of leaves is washed at least 3 minutes, with occasional stirring, in 1,000 cc. of a 0.2 per cent solution of chemically pure nitric acid in water, either distilled or sufficiently pure to give correct results. A convenient amount of this acidulated wash water is treated with a few drops of 2 per cent solution of potassium-ferrocyanid solution, sufficient to precipitate the copper. A color comparison is then made with a series of known dilutions of a standard copper solution, similarly treated with the potassium-ferrocyanid solution. From this comparison the copper content of the wash water is determined. For more exact readings a colorimeter may be used."

The test promises to be of value to pathological investigators, agricultural experts, and commercial growers, "to secure data showing the persistence of copper-containing sprays as it may be influenced by method of preparation, weathering, or other factors; to determine the minimum and maximum limits of working safety zones, as measured by evenly distributed residues, effective for the practical control of specific diseases; to secure prompt correction of faulty spraying practices, either in the preparation of mixtures or in the times or modes of application, with a view to insuring more effective and economical protection of crops; and to serve as a practical guide in timing new applications, especially after rainy periods."

**Report of horticulturist**, C. A. McCue (*Delaware Sta. Bul. 122 (1918), pp. 25–28*).—A brief statement of progress made in various lines of work.

Variety tests of orchard and small fruits were continued. A list is given of peach varieties recommended for commercial plantings and those which have been rejected as having no value as commercial varieties. In the variety test of cherries Montmorency and various strains of this variety have proved most valuable for Delaware. It appears doubtful whether the sweet cherry will be valuable in Delaware orcharding.

Cover-crop studies in peach orchards have been completed. The results indicate that under Delaware conditions the cowpea is one of the best, if not the best, cover crop for peaches, but that no one cover crop is always best in a given peach orchard. The light and shade factor has an important bearing upon cover cropping. The soy bean is a valuable cover crop and oats is also recommended. Rape and cowhorn turnips may be used for the first three years, but not afterwards. Winter vetch is not a good cover crop for northern Delaware. It is concluded that in most cases sufficient nitrogen for good growth and yield of peaches can be supplied by proper cover cropping with leguminous plants, providing the cover crop is begun early in the life of the orchard and is continuous.

**[Report on horticultural investigations]** (*Georgia Sta. Rpts. 1917–18, pp. 11–13*).—Brief statements of progress made with various projects.

As a result of the collard breeding work a new commercial type has been established and the seed introduced to the trade. In the work of breeding and selection for a tomato resistant to blossom-end rot, $F_6$ generation plants resulting from a cross between the Red Cherry and the Greater Baltimore varieties proved to be susceptible to the blossom-end rot. Since previous filial generations of these plants, partaking more of the Cherry type, were immune to the blossom-end rot it appears that susceptibility has returned with increased size in the process of selection.

A considerable number of hybrids secured in the grape-breeding investigations produced their first fruit in 1918. It was observed that one white stami-

nate vine was decidedly prepotent in stamping good qualities of fruit characters on practically all of its progeny. A certain type of foliage variation was found to be closely correlated with sweetness of fruit. Four new varieties of muscadine hybrids were introduced in 1917, and named by the Georgie State Horticultural Society. Efforts to cross *Vitis rotundifolia* and *V. vinifera* failed.

Report of the horticultural division, J. E. Higgins (*Hawaii Sta. Rpt. 1918, pp. 13–21, pls. 2*).—A brief report on extension activities, experimental work, and distribution of plants.

In the fall of 1917 a variety test of garden beans was conducted by J. H. Cowan. It was found that an important factor in successful bean production lies in the susceptibility of the different varieties to the attacks of the melon fly. Twenty-one per cent of the Stringless Green Pod was stung, and varying degrees of susceptibility were shown by the other varieties. Early Refugee and Refugee Wax received no injury whatever from the fly, and the Stringless Refugee and Ventura Wonder Wax suffered less than 1 per cent injury. There was uniformly a very much higher percentage of infestation in the first picking than in the second. After careful tests of cooking qualities, flavor, texture, and absence of strings, it was concluded that the Stringless Green Pod, the Early Refugee, and the Stringless Refugee beans were of most promise both for canning and for table use under the conditions existing at the station.

Tomato crosses were made by J. H. Cowan, with special reference to developing the fly-resistant character of certain small-fruited sorts with the greater size of some of the standard kinds. Flowers of the Earliana were crossed with pollen from the small wild form. $F_1$ fruits were variable and intermediate in size between the two parents, but they all appeared to be free from infestation, except where otherwise injured. The second generation also is recorded as having been free from attack at the station and many thousands of seeds and seedlings were distributed for further trial. In a cross between Red Pear and John Baer the first generation was practically free from attack of the melon fly, but the second has shown some degree of infestation. Observations thus far made indicate that any tomato to be bred for resistance to the fly must combine both evenness and smoothness of surface. The skin must be tough, with a degree of smoothness amounting almost to slipperiness. A tomato with a slight depression about the stem end is subject to attack, especially if the circle protected by a tightly fitting calyx is not greater in diameter than the length of the ovipositor.

The work with seedling pineapples (E. S. R., 38, p. 841) was continued during the year.

[Report on horticultural investigations in Illinois] (*Illinois Sta. Rpt. 1918, pp. 17–19*).—Brief statements are given of progress made in various lines of work.

The orchard fertilizer experiments have shown a progressively increasing yield in nitrogen-fertilized plats over plats not thus fertilized.

Apple blotch was effectively controlled by making applications of either lime-sulphur or Bordeaux three weeks and five weeks after the fall of the petals. Dusting controlled codling moth and curculio as effectively as spraying, but failed to control the fungus diseases. Calcium arsenate was satisfactory as a stomach poison, and did not injure fruit or foliage. Nicotin sulphate was only of value in controlling aphids. Acid or hydrogen lead arsenate reduced scab infection from 30 to 60 per cent when used without the usual fungicides. Standard commercial lime-sulphur diluted 1:50 was as effective as a 1:40 dilution.

Other conditions being favorable, moderate pruning of winter-injured peach trees gave better results as to form, growth, and fruit buds than severe pruning. Experiments on pear blight showed that infection may be carried by other agencies than insects.

Among the results secured in olericulture, tomato strains have been developed which have proved highly wilt-resistant as compared with commercial strains when grown on badly infected soil. A disease organism causing the rotting of onion sets in storage has been isolated and described. Experiments with greenhouse lettuce and tomatoes have shown that rich garden loam is not inferior to rotted sod as a basic soil for these crops, that large amounts of manure in the soil mixture greatly increase the yield, but that large amounts of sand decrease the yield, since the extra sand displaces a certain amount of fertilizer.

**[Report on horticultural investigations in New Mexico]** (*New Mexico Sta. Rpt. 1918, pp. 35–41, 44, fig. 1*).—Brief statements of progress made in cultural and varietal tests of orchard and small fruits, nuts, and vegetables.

**[Report on horticultural investigations in North Dakota]** (*North Dakota Sta. Rpt. 1917, pp. 14, 15*).—A brief statement of progress.

The station's work in tomato selection has progressed sufficiently to establish definitely the fact that early enough strains are available to make the production of tomatoes practical in that climate. The most promising varieties of celery, sweet corn, cauliflower, and strawberries under test are listed. Pedigreed strawberries have proved to be in most instances the poorest strains grown.

**Experiments on the supposed deterioration of varieties of vegetables in Porto Rico, with suggestions for seed preservation,** C. F. Kinman and T. B. McClelland (*Porto Rico Sta. Bul. 20 (1919), Spanish Ed., pp. 32, figs. 11*).—An English edition of this bulletin has been previously noted (E. S. R., 36, p. 340).

**Simple methods of celery culture,** W. J. Green (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 129–134, figs. 4*).—Methods of fertilizing, growing, blanching, and harvesting best suited to the home garden are described.

**Muskmelon culture in Michigan,** C. W. Waid (*Michigan Sta. Spec. Bul. 95 (1919), pp. 13, figs. 10*).—Popular instructions are given for growing, harvesting, and marketing muskmelons, including a descriptive list of varieties.

**Grafting and budding fruit trees,** W. J. Green (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 101–105, figs. 5*).—Methods of top-working and bridge-grafting fruit trees are described.

**The pruning of winter-injured peach trees,** A. J. Gunderson (*Illinois Sta. Bul. 218 (1919), pp. 383–394, figs. 13*).—The station conducted experiments in 1918 to determine the best pruning treatment for peach trees seriously injured during the winter of 1917–18. The results, which are here presented in detail, have been summarized in a previous paper by the author (E. S. R., 40, p. 835).

**The financial history of a 12-year-old peach orchard,** H. J. Eustace and F. M. Barden (*Michigan Sta. Spec. Bul. 94 (1919), pp. 15, fig. 1*).—In continuation of a previous report (E. S. R., 30, p. 443), the annual records are given of a 15-acre peach orchard located near South Haven, Mich.

The net profit from the orchard for the whole 12-year period was $11,263.05, or a net profit of $938.58 per year, $62.57 per acre per year, and 66 cts. per bushel. The orchard yielded a revenue from the interplanted corn crop the first year, but was managed at a loss the three following years, after which it yielded a profit every year.

**Description of hybrid plums and other new fruits,** C. Haralson (*Minn. Hort., 47 (1919), No. 4, p. 152*).—Several plums, a seedling blackberry, and an

ornamental cherry sent out for testing in 1919 from the Minnesota State Fruit Breeding Farm are described.

**Raspberry culture**, R. E. LOREE (*Michigan Sta. Circ. 37 (1919), pp. 16, figs. 11*).—Practical instructions are given for the culture and care of raspberries, including a descriptive list of varieties.

**The culture of currants and gooseberries**, R. E. LOREE (*Michigan Sta. Circ. 38 (1919), pp. 18, figs. 9*).—A circular similar to the above on currant and gooseberry culture.

**Almond pollination**, W. P. TUFTS (*California Sta. Bul. 306 (1919), pp. 337–366, figs. 15*).—A progress report on a study of the California varieties of almonds with reference to relative sterility or fertility, and the selection of suitable cross-pollinizers for commercial varieties. The data given cover observations and pollinating studies conducted by the author and others at the station for several years.

The results thus far secured indicate that for all practical purposes the cultivated almond is self-sterile, and orchards must be inter-planted with pollinizing varieties if they are to prove commercially profitable. Certain almond varieties are also inter-sterile. A list is given of varieties cross-pollinating satisfactorily. The California at present seems to be the one best pollinizer for all varieties thus far tested which have a coincident period of bloom. With regard to the length of their effective full bloom, the varieties tested are divided into two classes, early bloomers and late bloomers.

In making recommendations of varieties for inter-planting the author has aimed to keep in mind the date of blooming, abundance of pollen, and, to a limited extent, the productiveness and commercial value of the pollinizer. It is advised that care be taken in the arrangement of varieties in the orchard to facilitate cross-pollination and convenience in harvesting. Also, one colony of bees should be provided for each acre of orchard, since pollinizing agencies, such as the honeybee, are necessary to the set of a good crop of fruit.

**Fertilizer experiments with rice, bananas, and pineapples**, M. O. JOHNSON (*Hawaii Sta. Rpt. 1918, pp. 23–25, pl. 1*).—In these experiments dilute solutions of fertilizing salts were applied in the form of sprays to rice, banana, and pineapple plants. Ammonium sulphate was the only treatment to give any noticeable increase of yield of rice. Both ammonium sulphate and potassium sulphate solutions stimulated the growth of bananas. With pineapples, ammonium sulphate solution gave good results on manganese soils. Nitrate of lime produced very good results with pineapples on windward Oahu. Inasmuch as only a small amount of fertilizer can be supplied in a single spraying, this method of application does not appear practical except in certain special cases, as on manganese soils where ammonium sulphate can be added to the iron sulphate solution which is already being extensively used for spraying.

A small fertilizer experiment with pineapples was started in the fall of 1917, in the Waipio district of Oahu. Several insoluble fertilizers were applied singly and in mixtures directly in the heart of young plants. Up to the present time, dried blood at the rate of 250 lbs. per acre has given quite striking results. As the result of demonstration experiments conducted at the station this method of top feeding the pineapple with cottonseed meal or dried blood, commonly used in Porto Rico, is now being quite extensively adopted by the Hawaiian growers.

The iron sulphate spraying treatment developed by the station as a practical means for overcoming the various injurious effects of highly manganiferous soils on pineapples (E. S. R., 36, p. 850) has met with continued success and is being used extensively by commercial planters. In practice it has been ob-

served that iron must be frequently supplied to the plant during the periods of rapid growth, but that comparatively few sprayings are necessary during quiescent periods. Methods of treating manganese soil before planting to supply iron to the plant have thus far given no success, except where stable manure was used, in which case the pineapple is grown on the manure rather than on the soil.

Series of experiments were made with rice grown in nutrient solutions to determine the effect of additions of manganese dioxid and manganous sulphate in the presence of different amounts of ferrous sulphate, preliminary experiments having indicated that the effect of manganese depends largely on the amount of iron supplied by the solution. With the smallest amount of iron supplied, 5 mg. per liter, which was sufficient for the normal growth of the checks, manganese dioxid and manganous sulphate caused an extreme depression in growth, the plants in these solutions being light yellow in color with brownish spots. As the amounts of iron were increased up to the very excessive amount of 80 mg. per liter the injurious effects of the manganese were overcome and growth approached that of the checks. Dipping the leaves of the plants at intervals in a dilute solution of ferrous sulphate was also partially effective in overcoming the injurious effects of manganese dioxid. The experiment was repeated with ferric chlorid and with ferric citrate as sources of iron and gave similar results. The beneficial effect on growth of adding manganese to nutrient solutions claimed by several investigators is believed to be due to the facts that in most cases the effect on growth was determined only by rough measurements of the increase in the height of the plants and that the iron content of the nutrient solutions used was not only sufficient for normal growth but was so excessive as to mask the injurious effects of manganese.

## FORESTRY.

**A national lumber and forest policy,** H. S. Graves (*U. S. Dept. Agr., Off. Sec. Circ. 134 (1919), pp. 14; Jour. Forestry, 17 (1919), No. 4, pp. 351–363*).—An address delivered before the American Lumber Congress at Chicago, Ill., April 16, 1919, in which the author discusses the problems causing the present unstable condition of the lumber industry, and makes an appeal for cooperation in laying the groundwork for a national policy in carrying out and administering the great private resources of timber so as to prevent the present waste and uneconomic overproduction and at the same time to insure forest renewal. Some of the principles, aims, and problems of such a national policy are briefly outlined. Among other points the acquisition on the part of the Federal Government and the States and municipalities of cut-over and nonagricultural lands, especially those bordered by watersheds, with the object of reforesting them is advocated.

**Vacation days in the Battlement National Forest** (*U. S. Dept. Agr., Forest Serv., 1919, pp. 13, pl. 1, figs. 4*).—A popular document describing the recreational features of the Battlement National Forest in Colorado.

**Report of the superintendent of forestry,** C. S. Judd ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1917–18, pp. 19–46, pls. 9*).—A report for the calendar years 1917 and 1918 relative to the work of forest protection and extension, including operations on the Government reserves and nurseries and private planting work.

The work of examining, surveying, and setting aside the main forest reserve system has been concluded. The reserves which are shown on maps now include 811,926 acres, 68 per cent of which is Government land. The results of experi-

mental planting on Haleakala, Maui, show that temperature zone coniferous trees, such as the Jeffrey pine of California, do well at an elevation of 6,700 ft., with a height growth in 8 years of 11 ft. and a diameter of 3.5 in. Of 18 different kinds of Eucalyptus trees set out in Nuuanu Valley, the Blackbutt shows up best, with a yield of 4.5 cords per acre after 5 years' growth.

**Report of the forest nurseryman**, D. HAUGHS ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1917–18, pp. 47–50*).—A brief report for the years 1917 and 1918 relative to collection and exchange of seed, trees distributed from the Government nurseries, and miscellaneous work.

**Annual progress report on forest administration in the Presidency of Bengal for the year 1916–17**, H. A. FARRINGTON (*Rpt. Forest Admin. Bengal. 1916–17, pp. II+53+4*).—The usual progress report on the constitution and management of the State forests of Bengal. Detailed data relative to alterations in forest areas, forest settlements, forest surveys, working plans, forest protection, silvicultural operations, yields in major and minor forest products, revenue, expenditures, etc., are appended.

**Progress report on forest administration in the Northwest Frontier Province for the year 1917–18**, R. PARNELL (*Rpt. Forest Admin. Northwest Frontier Prov., 1917–18, pp. [21]+XXI*).—A report similar to the above relative to the administration of the State forests in the Northwest Frontier Province for 1917–18.

**Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1917–18**, F. TRAFFORD (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1917–18, pp. [64]*).—A report similar to the above relative to the administration of the State forests in the Province of Bihar and Orissa for 1917–18.

**The resources of our colonial forests**, H. BOUTTEVILLE (*Bul. Soc. Encour. Indus. Nat.* [*Paris*], *118 (1919), I, No. 2, pp. 258–283*).—A report on the extent and economic importance of French colonial forests, including a review of the causes which have thus far prevented their exploitation and recommendations relative to means of promoting a greater utilization of colonial woods.

**Official note on the colonial woods** (*Bul. Soc. Encour. Indus. Nat.* [*Paris*], *118 (1919), I, No. 2, pp. 284–298*).—A tabular inventory of exploitable woods of the Ivory Coast and Gabon, Africa, prepared under the direction of the French Colonial Ministry. The woods are grouped into seven different categories, with special reference to European and American woods which they might replace to advantage. Each wood is considered with reference to its botanical and native names, color, texture and general appearance, relative durability, and uses.

**Selection and thinning**, A. A. L. RUTGERS (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 3, pp. 105–115, 119–123, pls. 8*).—A summary of a lecture on this subject, in which the author reviews the results of a number of selection and thinning experiments to show the importance of these factors in reducing the cost price of raw rubber.

**The structure of the lactiferous vessel system of Hevea**, W. H. ARISZ (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 3, pp. 139–155, figs. 12*).—In contradiction to results which have been obtained by other experimenters the author found that the various concentric layers of latex vessels in the stem are connected with each other. The greater number of layers at the base of a tree is caused by the existence of communication layers, and only to a very limited extent is due to a few short layers which are connected with the adjacent layers. The lactiferous vessels of the stem have their continuation in the same way in the main root. The number of lactiferous layers in the lateral branches depend upon the age of the branch.

In consequence of the existence of communications between adjacent latex vessels, it is concluded that lactiferous layers not opened by the tapping operation can nevertheless in the long run have some influence on the latex yield. Latex obtained from a tapping cut made at the base of the stem can have proceeded from the stem, the main root, or the larger lateral branches and roots. The latex of the leaves and secondary or tertiary lateral branches can not proceed to the cut in view of the fact that a sufficient number of continuous lactiferous vessels has not been developed.

**The effect of time intervals in rubber tapping**, T. PETCH (*Dept. Agr. Ceylon Bul. 42 (1919), pp. 8*).—Results are given of experiments begun in 1912 to determine the effect on yield of latex of tapping rubber trees at varying intervals.

The experiment, as a whole, shows that the yield of latex per tapping in twice per week tapping is greater than that in thrice per week tapping, but that tapping once per week does not give a greater yield than tapping twice per week. The greatest quantity of rubber was obtained from the most frequent tapping, but the total yield obtained by tapping 3 times per week has been only about 12 per cent greater than that obtained by tapping twice per week. The percentage of rubber in the latex increased as the time interval increased. The difference between the percentages of scrap obtained in tapping twice per week and 3 times a week, respectively, is very small.

**Influence of a change in tapping surface on latex and rubber**, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 3, pp. 130–138*).—Experiments conducted by the author indicate that when a change of tapping surface is accompanied by a change of tapping system the properties of the rubber may be expected to be affected to some extent. The difference is more marked when changing to heavier tapping than when changing to milder tapping. It is pointed out, however, that the change of tapping surface in ordinary estate routine need not be regarded as a cause of variability, such as undoubtedly is formed by the opening of a new cut or the reopening of a cut after a period of rest.

**Rubber tapping experiments: Two cuts v. one cut**, T. PETCH (*Dept. Agr. Ceylon Bul. 41 (1918), pp. 6*).—Tapping experiments were started at Henaratgoda in 1916 and continued for about 21 months in which the latex yield from a single oblique cut on one quarter of the tree was compared with the yield from two cuts on the opposite quarter of the tree. In one group of trees the two cuts were made 1 ft. apart and in another group 2 ft. apart. In both groups the lower cut was made about 15 in. above the ground at the same height as the single cut on the opposite quarter.

For the group of trees on which the two cuts were 1 ft. apart, the upper cut at first appeared to stimulate a greater flow of latex from the lower cut than the flow from the single cut on the opposite quarter. This apparently stimulating effect disappeared in a few months, however, after which the flow from the lower cut was less than from the single cut. In the other group of trees with the two cuts spaced 2 ft. apart, the upper cut apparently exerted a beneficial influence on the flow of latex from the lower cut as compared with the single cut throughout the duration of the experiment. In both groups of trees the yield from the upper cut averaged about half that of the lower. The author is inclined to believe that the increased flow of the lower cut in the second group of trees is due to a possible tendency of certain trees to yield more latex on one side than on the other rather than to any stimulating influence of an upper cut.

**Latex and rubber from upper and lower cut**, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 3, pp. 124–129*).—Analyses made by the author indicates that where two cuts are made on one quarter of a rubber tree the latex from the upper and lower cut may for practical purposes be regarded as identical in quality.

## DISEASES OF PLANTS.

**Physiological specialization of parasitic fungi**, G. M. REED (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 348–409*).—This paper is the outcome of an attempt to bring together the results of numerous investigations bearing on specialization of fungi in connection with particular hosts. It deals extensively with the Uredineæ, the Erysiphaceæ, and other fungi in relation to other plants as normal or as bridging hosts. It is considered especially desirable to know the exact host relations of the different races, as well as to determine whether the races are stable and constant or whether they are capable of a change in virulence and consequently able to extend their host range.

**Studies in the genus Gymnosporangium.—I, Notes on the distribution of the mycelium, buffer cells, and the germination of æcidiospore**, B. O. DODGE (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 128–140, pl. 1, figs. 5*).—The author reports briefly studies designed to determine the distribution of the mycelium of Gymnosporangium in the different portions of an infected plant.

**A method of obtaining abundant sporulation in cultures of Macrosporium solani**, L. O. KUNKEL (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 306–312, figs. 4*).—Having employed in work previously noted (E. S. R., 31, p. 730) a method of retarding growth of *Monilia sitophila* by lowering the vapor tension of the atmosphere above the pure cultures, as a result of which the fungus was made to fruit more abundantly than in a moist atmosphere, the author employed this treatment in an effort to induce sporulation in *Macrosporium solani*. It was found that this fungus would fruit profusely when growing in any of the media employed under such conditions, especially if the mycelium was wounded after the culture had obtained a good start as here described. Contrasts were noted as observed between *M. solani*, *M. tomato*, and *M. daturæ* when these fungi are grown side by side in pure cultures.

**Notes on some methods and terms employed in studying the Uredinales**, H. R. ROSEN (*Phytopathology, 8 (1918), No. 11, pp. 581–583*).—The author describes the methods and terminology used by J. C. Arthur and those associated with him in preparing the data relating to rusts published in the North American Flora.

**The Uredinales of Oregon**, H. S. JACKSON (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 198–297*).—This represents work by the author and others in collecting material in several portions of Oregon. In all 220 species are recorded as occurring on 500 host plants, the number of species being considered as worthy of mention on account of their economic bearing. All the grain rusts yet recorded for North America are known to occur in the State except the corn rust (*Puccinia sorghi*). All the rusts which are troublesome to florists are represented. The Pacific coast rust of pears and quinces threatens to become of economic importance. Many partially known rusts are found in this section. Notes on distribution are given in some cases. The genera are listed alphabetically and the species thereunder with their host plants.

**The relations of crown gall to other overgrowths in plants**, E. F. SMITH (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 448–453*).—The author proceeds upon the expressed belief that all overgrowths are correlated phenomena, the response of the organism to essentially similar, but not necessarily identical

stimuli, and that visible difference in response when brought about by parasites is due to the number and location of the parasites, age and kind of tissues invaded, and volume, direction, and velocity of the stimulus exerted, every case being primarily a physical stimulus due to changed osmotic pressure rather than a direct chemical stimulus. He discusses briefly the factors governing overgrowth in crown gall, some other types of plant galls, and crown galls formed by extrusion of chemical substances and other effects of parasitic excretions. References are given to literature on the subject.

**An automatic spore trap**, F. D. FROMME (*Phytopathology, 8 (1918), No. 10, pp. 542–544, fig. 1*).—A description is given of a spore trap in which an alarm clock revolves a Petri dish containing nonnutrient agar, the dish being covered by a metal piece so arranged as to expose one-twelfth of the area of the dish through an hour's time. This trap is said to have been used in studying the dissemination of the basidiospores of *Gymnosporangium juniperi-virginianæ* with rather satisfactory results.

**[Plant diseases and treatments]**, H. E. WATERBURY (*Bien. Rpt. Dept. Agr. Wash., 3 (1917–18), pp. 84–87*).—The results of tests with a third application of iron sulphid or atomic sulphur for apple powdery mildew indicate that such an application is justified, at least where the infection is pronounced, iron sulphid being the cheaper and more effective. Some very good results were secured by the use of lime-sulphur with atomic sulphur, the results being due apparently to the more rapid volatilization, but these results were more noticeable on the fruit than on the foliage and twigs. Milled sulphur is to be tested in this connection.

Potato seed tubers treated for Rhizoctonia for 1½ hours with corrosive sublimate at a strength of ¼ lb. to 30 gal. of water showed results as good as those obtained by treating for 2 hours or with a stronger solution. Apparently the same treatment was effective against potato scab.

Experiments with dust sprays applied under somewhat adverse conditions yielded results not quite so good as those with lime-sulphur.

**Report of the division of plant pathology**, C. W. CARPENTER (*Hawaii Sta. Rpt. 1918, pp. 35–45, pls. 3*).—Among the diseases reported upon, the author gives a further description of the banana freckle or black spot disease, which has been previously noted (E. S. R., 38, p. 848). This disease seems to be spreading rapidly, causing considerable loss, the infected plants producing undersized, discolored and unevenly ripened fruit. The fungus attacks both leaves and fruit, defoliating and weakening the plants and rendering the fruit so unsightly that it is worthless for market purposes. The results of investigations of the fungus are given, and since the perfect stage is unknown the organism is tentatively described as *Phoma musæ* n. sp. For the control of this disease, the author recommends sanitary measures. A fungus similar to *P. musæ* has been found associated with a black spot disease of algaroba (*Prosopis chilensis*) pods.

Considerable attention has been given to diseases of the Irish potato, some of which seem quite serious in Hawaii. The mite disease previously described (E. S. R., 40, p. 644) is said to yield to dusting with dry sulphur or to spraying with lime-sulphur spray. This trouble seems to be associated with dry weather, and it is not anticipated that it will prove a serious menace to the potato industry at elevations of 1,500 to 4,000 feet except in abnormally dry years. Spraying experiments for the control of late blight are said to have given very satisfactory results. A description is given of a potato variety which exhibits considerable resistance to the late blight.

Notes are given on coffee diseases, as well as miscellaneous insect and fungus diseases observed during the year or not hitherto reported.

The author also reports having demonstrated the presence of stomata on the underside of the leaves of pineapple plants.

**Pathological laboratory [notes]** (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 1 (1918), pp. 39–42*).—In this portion of the 1917 report it is stated that, although American gooseberry mildew appeared to be absent and whiteheads in wheat less destructive than during the previous year, much browning and scorching of potato foliage was noted. Among the diseases most prevalent were black currant rust (*Cronartium ribicola*), bean pod canker, potato blackleg and scab, plum rust, die-back and sooty blotch of apples, and onion diseases (Sclerotinia and Botrytis). Notes are also given regarding American gooseberry mildew (*Sphærotheca mors-uvæ*), parsnip canker, potato wart disease, and apple mildew (*Podosphæra leucotricha*). A comparative study has been made of the morphology and parasitism of the fungus *B. cinerea*, particularly in *Æsculus pavia* and *Ribes alpinum*. Progress has also been made in the investigation of *Thielavia basicola*.

**Pathological problems in the distribution of perishable plant products,** C. L. Shear (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 415–422, pls. 3*).—In order to indicate the variety and complexity of the problems involved in the transportation of perishable plant products, typical cases are described in connection with suggestions regarding protective measures considered as practicable.

**Seed disinfection by formaldehyde vapor,** C. C. Thomas (*Jour. Agr. Research [U. S.], 17 (1919), No. 1, pp. 33–39, fig. 1*).—In a contribution from the Federal Horticultural Board, U. S. Department of Agriculture, a preliminary report is given of a study of methods of seed disinfection that would be applicable to the treatment of considerable quantities of seed. The author devised a form of apparatus by which formaldehyde vapor may be used, and he reports upon the effect on seeds as well as on fungi and bacteria of various strengths of the vapor employed for different periods of time.

A tabulation is given showing the effect of formaldehyde vapor on 20 different kinds of seeds, from which it appears that little or no injury followed the subjection of the seed for from 1 to 3 hours to the formaldehyde vapor. Studies of various fungi and bacteria showed that the formaldehyde solution vapor destroyed the organisms in about 1 hour if they were exposed in a thin film, but where masses of spores were used more time was required to kill them. Formaldehyde vapor and a 2 per cent formalin solution were compared, 10 different kinds of seeds being used, and in all cases the 2 per cent formalin solution sample was intermediate between the checks and those treated with formaldehyde vapor. The vapor treated samples are said to have been remarkably free from fungi and bacteria.

In conclusion, the author states that the use of liquids for disinfection is unsatisfactory for many kinds of seeds. A number of species of fungi and bacteria were killed when treated for 2 hours with 20 oz. formaldehyde vaporized in 1,000 cu. ft. without any injury to the seeds tested.

**An epidemic of corn smut following hail,** H. G. MacMillan (*Phytopathology, 8 (1918), No. 11, pp. 584, 585*).—An account is given of an epidemic of corn smut following a severe hailstorm in a small district near Greeley, Colo. Sixteen days after the storm, fields of smutted corn were observed averaging 19 per cent of infection, while other fields outside the hail area showed only 1 per cent of infection.

**Varietal susceptibility of beans to strains of Colletotrichum lindemuthianum,** M. F. Barrus (*Phytopathology, 8 (1918), No. 12, pp. 589–614, pls. 5*).—On account of the possible bearing on plant breeding and also as possibly offering some suggestions as to the factors responsible for resistance to disease,

the author has carried on inoculation experiments with about 240 varieties and species of bean and related plants to test their susceptibility to strains of *C. lindemuthianum*, the presence of which was previously reported (E. S. R., 26, p. 747). Several species of Phaseolus and also species of other genera were found to be affected with the anthracnose to some extent, but they were not favorable host plants for the parasite. Some varieties of beans were found susceptible to one strain of the fungus and others to a second. Resistance was found in many distantly related plants. The degree of susceptibility of the different varieties is indicated.

**Varieties of beans susceptible to mosaic**, D. REDDICK and V. B. STEWART (*Phytopathology, 8 (1918), No. 10, pp. 530–534*).—During the progress of a study of the mosaic diseases of beans, the authors tested the susceptibility to this disease of a number of the more common varieties of *Phascolus vulgaris*. About 30 varieties showed unmistakable symptoms of mosaic as a result of inoculation, while others which did not develop mosaic as a result of a single test are under further observation.

**A storage fermentation of dasheens**, O. T. WILSON (*Phytopathology, 8 (1918), No. 10, pp. 547–549, fig. 1*).—From a study of a peculiar rotting of dasheens in storage, the author has found that it is due to yeasts. These under some conditions secure access to the tissues of the corms and tubers and cause a fermentation of the sugars, rendering the affected parts useless for food.

**Ramularia root rots of ginseng**, C. L. ZINSSMEISTER (*Phytopathology, 8 (1918), No. 11, pp. 557–571, figs. 8*).—A description is given of a disease of the roots of American ginseng popularly known as rust. The roots are said to show dark brown, dry lesions, at first small and scattered but finally becoming widespread and deep-seated. Two types of injury are recognized. In the first, the injury is merely superficial and is confined to a few layers of cells immediately beneath the epidermis. In the second, the lesion extends through the cortex, frequently involving the stele, and in many cases the rot extends throughout the entire cross section of the root. The disease is said to be widely distributed, and it is expected that it will be found in almost all ginseng regions.

A study of the cause of the disease revealed the presence of two species of Ramularia, to which the names *R. destructans* and *R. panacicola* n. spp. are given. The cultural characteristics and morphology of the organisms are described, and technical descriptions of both species are included.

**Diseases of parsnips**, A. D. COTTON (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 1 (1919), pp. 8–21, pls. 2, figs. 2*).—Recent study of the disease of parsnips known as canker, which does much damage in certain localities or situations (the degree of injury being affected apparently by conditions and varieties), has shown that the trouble is due primarily to physiological phenomena involving rupture not followed by renewal of the surface tissue, and not directly to invasion by fungi, although these organisms are afterwards involved. The contributory conditions are discussed. Preventive measures include rectification of certain cultural practices and the use of potash and salt to retard maturation. Other parsnip diseases are discussed.

**Diseases of parsnips**, A. D. COTTON (*Jour. Bd. Agr. [London], 25 (1918), No. 1, pp. 61–71, pls. 2*).—This reproduces most of the report noted above on parsnip canker, omitting notes of other diseases mentioned in that article.

**Potato leaf roll: Its diagnosis and cause**, E. J. WORTLEY (*Phytopathology, 8 (1918), No. 10, pp. 507–529, figs. 16*).—After an account of the losses due to leaf roll of potatoes in Bermuda, the author gives the diagnosis of leaf roll and presents the various theories regarding its cause.

Among the symptoms of leaf roll which are often overlooked, the author calls attention to the rolling and rigidity of the lower leaves. The rolling of the upper leaves in some varieties is said to be not particularly conspicuous, while the rolling of the lower leaves seems to be very typical of the disease. Leaf roll may be detected from 5 to 8 weeks after planting, and the author claims that it is safe to assume that if there is no evidence of leaf roll when the plants are 9 weeks old the disease will not develop later.

In discussing causes, the author states that there is little room for doubt that unfavorable climatic conditions in the previous season or seasons are important factors in the development of leaf roll.

**Two tomato diseases.** E. S. REYNOLDS (*Phytopathology, 8 (1918), No. 10, pp. 535–542, figs. 2*).—Descriptions are given of a chlorosis of the leaves and a fruit rot observed in greenhouse tomatoes in the winter of 1913–14.

The chlorosis is attributed to unknown environmental conditions surrounding the plants when the leaves were in a very young or embryonic condition. The fruit rot, which is considered the same as the blossom end rot, was studied at some length but no causative organisms were found present. The hypothesis is proposed that this disease is due to an organism, probably ultramicroscopic, which infects at pollination time only and causes the rotting area to enlarge until such time as physiological processes of the maturing of the fruit render further invasion impossible.

**Tomato wilt** (*Georgia Sta. Rpts. 1917–18, pp. 14, 15*).—A brief account is given of investigations on the tomato wilt due to *Fusarium lycopersici*. It is reported that the mode of infection has been studied and has been found to be through the root tips, up the water ducts, and into the stem of the plant.

Various soil treatments for the control of the disease have been investigated without any promise of success. It is considered that the breeding of wilt-resistant varieties will probably prove the most satisfactory method of control.

**The origin and spread of tomato fruit rots in transit.** J. ROSENBAUM (*Phytopathology, 8 (1918), No. 11, pp. 572–580, pl. 1, fig. 1*).—As a result of a study of diseases occurring on tomato fruits in transit, the author states that, with the possible exception of Phoma rot and leak due to *Rhizopus* sp., tomato fruit rots found upon the arrival of the car do not originate in transit but in the field and spread from one or more infected fruits included in the pack. The transit and other conditions favoring the development of Phoma rot and leak have not been determined, but overripeness of the fruit and bruises and other injuries are considered as predisposing causes.

From their ability to spread in transit, the author divides tomato fruit rots into three groups, (1) those where the causal fungus can spread and infect adjacent uninjured fruit, (2) those where the causal organism can spread but can infect the fruit only through the stem end or through some break in the skin of the fruit, and (3) those where the fungus is unable to grow through the tomato wrappers and infect healthy tomato fruit. The buckeye rot due to *Phytophthora terrestria* is said to represent the first group. The second group includes the soil rot (*Rhizoctonia* sp.), white rot (*Sclerotium rolfsii*), and leak (*Rhizopus* sp.). Examples of the third group of rots are the nail head spot (*Macrosporium solani*), black spot (*Phoma destructiva*), and anthracnose (*Colletotrichum phomoides*).

**An apple canker due to Cytospora.** F. L. STEVENS (*Illinois Sta. Bul. 211 (1919), pp. 867–878, pl. 1, figs. 16*).—A description is given of a canker observed in 1918 on young apple trees. No abrasion or wound seemed to mark the place of the original infection. For the most part the cankered areas exhibited a tan color, the demarcation between diseased and healthy tissues being very sharp-

The disease is apparently of fungus origin. Isolations were repeatedly made, and inoculations from pure cultures on apple, pear, rose, blackberry, plum, and peach twigs kept in test tubes resulted in rapid growth and the development of conditions identical with those observed in the natural canker. No attempts were made to produce the disease on trees in the open, as it was feared from the rapid development made that the disease might occasion serious loss.

The fungus which causes the disease is said to belong to the genus Cytospora, but it has not been specifically identified owing to the confusion between the species of this and closely allied genera on various rosaceous hosts. Lists are given of about 60 species of Valsa and Cytospora which have been reported on various species of Rosaceæ.

A bibliography of the literature completes the publication.

**Peach diseases.** T. F. Manns (*Delaware Sta. Bul. 122 (1918), p. 39*).—A brief account is given of inoculation work with peach yellows and little peach in the experimental orchard. Natural infection through bruising and rubbing as by harness, etc., from infected trees to healthy trees was not found to bring about a great amount of infection. The author records the complete recovery of two out of five trees which were inoculated with yellows in 1916 and showed typical symptoms of the disease in 1917, two recovering completely in 1918. Two of the trees of this series are reported as dead and another nearly so.

Placing tree protectors around trees to keep away borers has given very poor results.

**Wood rots of peach trees caused by Coriolus prolificans and C. versicolor.** J. A. Elliott (*Phytopathology, 8 (1918), No. 12, pp. 615–617, figs. 2*).—Parasitic wood rots of peach trees due to *C. prolificans* and *C. versicolor* are described by the author as occurring near Lamar, Ark., on peach trees that had been rather severely cut back. The parasitism of the fungi was considered evident, as the trees had made a vigorous growth for one or two seasons following the cutting back and had then been checked by the destruction not only of the heartwood of the older trees but of the sapwood as well. The destructiveness of the rots is said to have been limited to certain localities, the orchard in question being on relatively low, heavy soil, while in other orchards in the vicinity, on higher ground and lighter soil, trees which had been cut back in a similar way showed no signs of the rot.

**A Sterigmatocystis smut of figs.** R. W. Hodgson (*Phytopathology, 8 (1918), No. 10, pp. 545, 546*).—The author states that California growers of White Adriatic figs have experienced losses due to a black discoloration of the fruit. A survey was made of some of the packing houses and a considerable quantity of infected figs was found. Cultures made from such figs have uniformly shown the presence of a Sterigmatocystis. The percentage of badly infected fruit is relatively small, but a larger percentage is infected to a slight extent. When opened, these figs show a streak or two of a black, gummy nature which greatly detracts from the appearance of the figs. The gummy masses in small quantity are said not to injure the flavor of the fruit, and such figs can be used in the manufacture of fig paste. The fungus is said to be the same as that causing the internal rot of pomegranates previously described (E. S. R., 29, p. 549).

The prevailing practice in preparing dried figs is to allow them to remain on the ground for 10 days or 2 weeks. The author believes that gathering the fruit at shorter intervals, while resulting in a much better dried fig, will also prevent at least a certain amount of black smut.

**Early occurrence of citrus scab in Japan.** H. S. Lee (*Phytopathology, 7 (1917), No. 10, p. 551*).—The author notes the occurrence of citrus scab lesions

on *Citrus nobilis* material collected in 1863 at Nagasaki, Japan, and now in the Hongkong Botanic Gardens herbarium.

**The problem of the imported plant disease as illustrated by the white pine blister rust**, H. METCALF (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 327–333, pls. 2*).—Attention is called to the danger and the possibilities that exist in the plant disease situation as outlined and as illustrated by white pine blister rust for 3 sections of the United States. In the first of these, lying west of the Mississippi River, this disease is not known to occur; in the second, east of the Mississippi River to the Hudson River, areas are indicated as heavily infected; in the third, east of the Hudson River, the case is so desperate that only the elimination of all Ribes will save the pines.

**The overwintering of Cronartium ribicola on Ribes**, H. H. YORK and P. SPAULDING (*Phytopathology, 8 (1918), No. 12, pp. 617–619*).—It is claimed that *C. ribicola* may occasionally winter over on dead Ribes leaves, thus perpetuating the fungus in localities where pines are absent.

**Overwintering of the æciospores of Cronartium ribicola**, L. DOSDALL (*Phytopathology, 8 (1918), No. 12, p. 619*).—The author reports observing in April, 1918, a branch of white pine which was covered by a heavy infection of white pine blister rust. The branch showed many æcial scars, and a study of the material is believed to have shown that the æciospores produced in 1917 still germinated in the spring of 1918, thus indicating the overwintering of the rust in this manner.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Eighteenth report of the State entomologist of Connecticut for the year 1918**, W. E. BRITTON (*Connecticut State Sta. Bul. 211 (1919), pp. 249–352, pls. 16, figs. 7*).—The first part of this report relates to administrative and regulatory work, including the inspection of nurseries, of imported nursery stock, and of apiaries, with locality records of the occurrence of European and of American foul brood in the State. Papers are next presented on Suppressing the Gipsy and Brown-tail Moths in 1918, by W. E. Britton, I. W. Davis, and J. T. Ashworth (pp. 272–290) and on Record of Treatments in an Attempt to Control the Striped Cucumber Beetle (*Diabrotica vittata*), by W. E. Britton and M. P. Zappe (pp. 290–292) which relates to work carried on in continuation of that commenced several years ago. Of the several treatments which gave favorable results the first in the order of effectiveness is lead arsenate and powdered sulphur, equal parts, dusted on both sides of the leaves. Spraying experiments in orchards at Clintonville, by M. P. Zappe (pp. 292, 293) are in continuation of those of the previous year (E. S. R., 39, p. 760), the results of which are presented in tabular form.

Tests of Sprays to Control the Potato Aphid, by W. E. Britton and M. P. Zappe (pp. 294–297), a summarized account of which is noted on page 162, show that kerosene emulsion will destroy all lice hit, while the materials cost about half as much as nicotin and can be obtained at any grocery store. A summarized account of the oriental peach moth (pp. 298–306) here presented is based upon the papers by Wood and Selkregg (E. S. R., 39, p. 259) and by Garman (E. S. R., 39, p. 260) previously noted.

In a report of studies of the peach twig moth it is stated that attention was called to its presence in the State to an extent not before realized. The account includes a bibliography of 22 titles.

The Life History and Development of the Greenhouse Cockroach (*Pycnoscelus surinamensis*), by M. P. Zappe (pp. 311–313) supplements a detailed account previously noted (E. S. R., 39, p. 761). This paper includes descriptions of the

immature stages, observations on its life history, and effect of cold. There were found to be six molts, the average length of time for reaching the adult stage being about 7.5 months.

In a discussion of the occurrence of the European house cricket (*Gryllus domesticus*) (pp. 313–316), M. P. Zappe gives a brief summary of information relating to it and records its occurrence in the attic of a new house at Shelton where it annoyed the occupants by its nightly chirpings and by getting into the food in the pantry on the floor below. This infestation was controlled by the use of poison baits, one of which contained borax and the other bichlorid of mercury.

A summarized account of the European corn borer (*Pyrausta nubilalis*), which may occur in Connecticut (pp. 316–327), includes an annotated bibliography of 21 titles. In a brief account of the bean leaf beetle (pp. 327–329) it is stated that it was reported in 1918 as injuring beans in Connecticut for the first time for many years.

Injury by the raspberry sawfly (*Monophadnoides rubi*) (pp. 329–331) in a field of about an acre of red raspberries in New Haven is reported upon in which at the time of examination on May 29 practically all the old leaves had been eaten while the new and tender shoots were uninjured. It is pointed out that since there is only one brood each year, treatment by spraying with hellebore or lead arsenate is a simple matter if applied in season. The spraying must be done soon after the plants blossom and may be applied even before they blossom to prevent defoliation.

The Iris root borer (*Macronoctua onusta*) (pp. 331–333) which was a source of injury to Iris beds through tunneling in the root stalks is briefly considered. A brief account of garden slugs (pp. 333–336) is followed by a report of mosquito work in 1918 (pp. 337–340) by B. H. Walden. A note on entomological features of the season is followed by miscellaneous insect notes, which deal with a larva on tartarian honeysuckle (*Harpipteryx* sp.), the clavate tortoise beetle (*Coptocycla clavata*), abundance of potato or cucumber fleabeetle, the rose chafer, salt marsh caterpillar feeding on beans, abundance of 3-lined potato beetle (*Lema trilineata*), birch leaf skeletonizer (*Bucculatrix canadensisella*), leaf tyer on rose (*Tortrix albicomana*), *Schizura unicornis* on hickory, the saddled prominent in Litchfield County (*Heterocampa guttiritta*), absence of tent caterpillar, an orchid weevil in Connecticut (*Diorymellus lævimargo*), *Chamyris cerintha* feeding on privet, white woolly larvæ on hickory (*Erythraspides caryæ*), the chrysanthemum gall midge (*Diarthonomyia hypogæa*), *Calosoma sycophanta*, the stalk borer in corn, the poplar girdler (*Saperda concolor*), the elm leaf beetle, a tip borer in garden Physostegia (*Olethreutes hebesana*), and a rare moth (*Tetralopha robustella*) attacking white pine.

[Insect notes] (*New Mexico Sta. Rpt. 1918, pp. 24, 25*).—In work with the squash bug it was found that blackleaf 40 (1:400), with soap 4 lbs. to 100 gal. killed all up to the next to the last stages that are hit. Two applications of this spray at intervals of a week controlled a severe infestation. The chrysomelid beetle *Coptocycla clavata*, whose native host plant is *Physalis* spp., attacked chili plants to a considerable extent in limited areas. *Eutettix tenella* was the source of considerable destruction through its transmission of curly leaf infection.

Thirty-third report of the State entomologist on injurious and other insects of the State of New York, 1917, E. P. Felt (*N. Y. State Mus. Bul. 202 (1917), pp. 240, pls. 12, figs. 82*).—In his report to the director of the State Museum the author includes a discussion of the occurrence of the more important insects of the year and work carried on with them.

Under the heading of Injurious Insects, work with the codling moth in continuation of that of the previous year (E. S. R., 40, p. 162) is first discussed, the details relating to experimental work being reported in part in tabular form. The general conclusions drawn are similar to those of the previous year.

A brief summary of information on the apple and thorn skeletonizer (*Hemerophila pariana*), together with a bibliography of 17 titles, is given. An account of this insect by the author has been previously noted (E. S. R., 38, p. 60).

The potato aphis (*Macrosiphum solanifolii*), next considered, occurred in great numbers during 1917 and was a source of considerable loss, particularly in the southeren part of the State. Experiments during the year are said to have demonstrated the efficacy of the nicotin soap preparations (0.75 pint of 40 per cent nicotin to 100 gal. of water to which are added from 6 to 8 lbs. of any cheap soap).

Under the heading Notes for the Year, the author discusses the more important fruit tree insects, small fruit insects, grass and grain pests, garden insects, and gall insects. Part 6 of A Study of Gall Midges (E. S. R., 40, p. 163), which deals with the tribe Itonididinariæ, is appended (pp. 76–205).

**[Experimental entomological work]**, H. E. Waterbury (*Ann. Rpt. Dist. Hort. Insp. Yakima County, Wash., 1917, pp. 25–54, fig. 1; Bien. Rpt. Dept. Agr. Wash., 3 (1917–18), pp. 78–87*).—Experiments with paste arsenate of lead for control of the codling moth confirm the results obtained the previous year (E. S. R., 38, p. 653). Four lbs. to 50 gal. of water shows about 10 per cent more clean fruit than 2 lbs. to 50 gal., and 30 per cent more clean fruit than 1 lb. to 50 gal. The results indicate, however, that 4 lbs. to 50 gal. is not necessary throughout the season, but that the beneficial results of the stronger solution are gained in the later applications.

In the experimental work, powdered arsenate of lead gave over 14 per cent more clean fruit than paste lead of equivalent strength. The results obtained from the use of nicotin sulphate during the year failed to confirm the earlier results (E. S. R., 38, p. 653), and led to the conclusion that nicotin under lower valley conditions is not so effective against codling moth as is arsenate of lead. In one experimental plat the nicotin was as effective as the lead but no more effective.

The use of calcium arsenate as a spray was unsatisfactory, due to its effect on fruit and foliage. This effect was noted about the middle of July, and by picking time a considerable proportion of the leaves had fallen and a burned area around the stems of some of the apples was noticeable. In addition there was a larger percentage of windfalls on the plat sprayed with calcium arsenate, this doubtless being due to the burning of the stems. The author considers it probable, however, that the burning was in part due to the condition of the orchard, which was allowed to become very dry during the summer.

The use of distillate oil emulsion at the rate of 1.5 gal. to 100 gal. of water destroyed the red spider with a single spray, and there was no burning or any other injury noticeable.

A summary is given of the results obtained from banding 230 trees for the codling moth.

**Insects injurious to the hop in New York, with special reference to the hop grub and the hop redbug**, I. M. Hawley (*New York Cornell Mem. 15 (1918), pp. 147–224, figs. 62*).—This is a report of investigations commenced in the spring of 1913 and continued in 1914 and 1915, the greater part of the account relating to investigations of the hop vine borer or hop grub (*Gortyna*

*immanis*) and methods of control. Two new pests, the hop redbug (*Paracalocoris hawleyi*) and the filamented looper (*Nematocampa limbata*) were also studied, as was the hop snout moth (*Hypena humuli*), an old but little-known pest. In addition some control experiments were conducted with the hop aphis under New York conditions, and notes are presented on several pests of lesser importance, namely, the red spider or spider mite (*Tetranychus telarius*), the hop merchants (*Polygonia interrogationis* and *P. comma*), leaf hoppers (*Empoasca flavescens* and *E. flavescens birdii*), a milliped (*Julus caruleocinctus*), a leaf miner (*Agromyza* sp.), flea beetles (*Psylliodes punctulata* etc.), and leaf rollers (*Archips rosaceana* and *A. argyrospila*). A list of several others is included.

The hop vine borer is a native insect, widely distributed in the northern United States and in Canada, which is only known to reach maturity on the hop. The injury is done to the head of the hop, the inside and outside of the vines, and in the roots. The loss occasioned varies greatly in different years and in different yards in any one year. In one yard in which the author worked, there were 90 dead vines in 100 hills, or a total loss of 20 per cent from the work of this insect, which is said to be a conservative estimate for the yard.

The eggs are laid on grass in and around hop yards from the middle of August to the last of September. The winter is passed in this stage and they hatch from the last week in April to the last of May. In an examination of distended females dissected, 866, 725, 457, and 612 eggs were obtained. Upon hatching out the larvæ make their way into grass or hop plants. "In grass they eat into the stem near the surface of the ground and feed upward, killing the central blade. They leave the grass at about the time other larvæ leave the inside of the hop. In the hop the young grubs enter the part that is the most readily available and easy to penetrate, which may be the head or any part of the vine. If the larva enters the head, it drops to the ground in about two weeks and helps to increase the large number already working in the vine near the root. About the first of June, when the larva is in the third or the fourth stage, it stops inside work and either feeds on the outside of the vine, nearly or quite severing it, or makes burrows in the root. In July or the first part of August the larva pupates, and the moth emerges the last of August or early in September." There appears to be six larval stages, the entire length of which is from 9 to 12 weeks. The length of the pupal stage in the laboratory varied from 35 to 37 days.

*Microplitis gortynæ*, a braconid, is a common parasite of the larva and two tachinids (*Frontina frenchii* and *Masicera myoidea*) apparently attack it. Control work, the details of which are reported in tabular form, has led to the recommendation (1) that all extra vines be pulled and removed some distance from the yard before June 1, (2) that the hops be hilled so as to give the extra rootlets an opportunity to grow, (3) that clean cultivation be practiced by removal of grass from the yard, and (4) that a plowed border several yards wide be maintained around the field. The use of paradichlorbenzene, a few crystals in each hill and covered with about 2 in. of dirt, about the third week in May may prove to be worth while.

The hop redbug has caused conspicuous injury to the foliage by perforations of the leaves and also a stunting and deformation of the stems during the past few years in yards about Waterville. The injury which it causes may be recognized by the deformed and stunted vines and the irregular holes in the leaves. The eggs which are inserted in the bark or the wood of hop poles from the middle of August to the middle of September hatch during the following June, or an egg period of 9 to 9.5 months. There are five nymphal stages for the

development of which 28 to 31 days are required. The application of nicotin sulphate, 1 pint to 100 gal. of water with 6 lbs. of soap added, on July 17 apparently killed the bugs at once. A weaker solution (3/8 pint to 100 gal.) appears to be insufficient for control.

The hop snout moth, which so far as known feeds only on the hop, has been found by the author to strip the hop vine of its leaves occasionally, but there has not been a general outbreak during the past five years. The eggs of the first brood are deposited about the middle of May on the underside of the hop leaves and hatch in three weeks. Eggs of the second brood have been found from July 28 to August 11. The larval stage of the first brood averages 25.3 days and the pupal stage 13 days. Full-grown larvæ of the first brood have been taken from June 17 to July 21, and those of the second brood from August 15 to September 6. Two tachinid flies (*Masicera rutila* and *Exorista hypenæ*) are said to parasitize the larvæ. The application of powdered arsenate of lead mixed with the sulphur used for hop mildew, at the rate of 1:10, has been effective in its control.

The filamented looper, a general feeder widely distributed in the eastern part of this continent, while not of great economic importance at the present time, is increasing in abundance and may become a serious leaf-eating pest of the hop. It is said to have been found on the hop in large numbers near Sangerfield, N. Y. The eggs, which are deposited beneath the bark or in cracks of hop poles the latter part of August, pass the winter, and hatch from the middle of May to the last of the following June. A period of about 10 months is passed in the egg stage, an average of 28.8 days in the larval stage, and 13.5 days in the pupal. Control measurers for the hop snout beetle should hold the filamented looper in check.

The hop aphis, which in some years has caused almost total loss of the hop crop, is briefly reported upon. Control experiments have led to the recommendation that nicotin sulphate 1:2,000 with soap be applied the last week in June or the first week in July.

The spider mite occasionally appears in hop yards in New York, but has never caused any serious damage as it has on the Pacific coast.

A bibliography of 33 titles and a list of 14 references to the literature cited are included.

**The Ohio wheat survey**, H. A. Gossard and T. H. Parks (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 58–66*).—Substantially noted from another source (E. S. R., 39, p. 863).

**Insects in relation to wheat flour and wheat flour substitutes**, R. N. Chapman (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 66–70*).—Substantially noted from another source (E. S. R., 40, p. 59).

**Some new phases of the entomology of disease, hygiene, and sanitation** brought about by the great war, W. D. Pierce (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 42–47*).

**Grasshopper control in Indiana**, J. J. Davis (*Indiana Sta. Circ. 88 (1919), pp. 8, figs. 9*).—This is a brief popular account of means for grasshopper control based upon cooperative work with the Bureau of Entomology of the U. S. Department of Agriculture.

**The meadow plant bug**, H. Osborn (*Maine Sta. Bul. 276 (1919), pp. 16, pl. 1, figs. 5*).—This is an account of *Miris dolabratus* based upon the more detailed paper by the author previously noted (E. S. R., 40, p. 260).

**Kerosene emulsion v. nicotin solution for combating the potato aphid**, W. E. Britton and M. P. Zappe (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 71–81*).—The authors found that kerosene emulsion, made at the rate of 3 cakes of laundry soap (30 oz.), 4 gal. of kerosene, and 2 gal. of hot water diluted to

make 50 gal., is effective in combating the potato plant louse, all the aphids hit by the spray being killed. The materials used for the emulsion cost about half as much as for nicotin solution, and possessed the additional advantage of being obtainable at any grocery store.

**Life history and habits of the mealy plum aphis**, W. M. DAVIDSON (*U. S. Dept. Agr. Bul. 774 (1919), pp. 16, pls. 2*).—For many years the mealy plum aphis (*Hyalopterus arundinis*) has been a source of injury in California to plums and prunes, and to a lesser extent to apricots, having been specially severe in some regions since 1913, particularly where artificial control of the pear thrips was not practiced.

Though of European origin, the species is widely distributed in North America and is known to occur in Australia, New Zealand, Java, and Japan. In California plums and prunes of the *P. domestica* type are the favorite hosts, but apricots and Asiatic types of plums and rarely almonds are also attacked, while in Europe grape, peach, and nectarines are attacked. Its injury is caused in the early summer months on the lower surface of the leaves and the petioles and upper surface are frequently infested. The young fruit is less commonly attacked. The leaves become curled and discolored and the tree produces fruit of small size and an early drop. In the years 1915 and 1916 an unusual midsummer apical cracking of green prunes developed in California.

The eggs, which are almost invariably laid in the axils of lateral buds of year-old or 2-year-old wood, commenced in 1916 to hatch about March 4 and continued for about 2 weeks. The early stem mothers began reproduction about March 20. Observations made at Walnut Creek between August, 1915, and December, 1916, are summarized as follows: "It appeared that normally from 3 to 5 generations were raised on the winter hosts, but rarely series of wingless generations persisted until the fall. The aphids of the earlier generations were mostly wingless like the stem mothers, and the individuals of the later generations mostly winged, and after the middle of June virtually all the insects produced developed wings.

"Migration to the summer hosts, Phragmites and Typha, began the last week in April and continued until August, the great body traveling in early June. On these hosts about ten generations took place, continuing up to November. The vast majority of aphids to be found during the summer were wingless, but winged parthenoparous individuals were also produced on the summer host plants, and these served to distribute the species among these plants. About the middle of October and for six weeks succeeding, winged sexuparous migrants and winged males were produced, and these flew to the fruit trees, whereupon the sexuparæ proceeded to deposit sexual females. The sexes were most abundant during the forepart of November and were to be found as late as the middle of December. Oviposition took place throughout November and December, the majority of ova having been placed before December 10."

Mention is made of a number of predatory enemies, of which it has many, but internal parasitism is said to occur rarely.

"There are two specially vulnerable periods in the annual life cycle of the mealy plum aphis—one in early spring when the stem mothers are growing and the other in late fall when the sexual females are developing on the winter hosts. . . . Contact insecticides, which have little effect on aphids of the intermediate generations, easily destroy the stem mothers and the egg-laying females."

**Seventeen-year locusts due in western Ohio**, H. A. GOSSARD (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 124–128, fig. 1*).—This article calls attention to the expected appearance of the periodical cicada over the western half of Ohio

during the summer of 1919, and gives advice as to prevention of damage and remedies.

**An European scale insect becoming a menace in Pennsylvania**, J. G. SANDERS (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 90, 91*).—*Lecanium prunastri*, which has in recent years become established in Pennsylvania, having been recorded a number of times from various places in central Pennsylvania at rather widely scattered points, has become sufficiently abundant in a few localities in the past two or three years to cause genuine damage and alarm to fruit growers. Some branches of the peach are said to have become completely covered with the scale, badly dwarfed, and ultimately killed. In orchards where the customary winter dormant spray with lime-sulphur is practiced the scale has not assumed dangerous proportions. Peach, sweet cherry, and apricot are its principal host plants.

**Recent results in the fumigation of citrus trees with liquid hydrocyanic acid**, R. S. WOGLUM (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 117–123, pl. 1*).—The author describes the successful use of liquid hydrocyanic acid in California, where he has been conducting an investigation of it with special reference to dosage requirements and during 1918 closely followed the fumigation of more than 500 acres of citrus trees.

In an experiment to determine the diffusion of the gas it was found that in each of 7 tented trees scale-kill was more effective against the purple scale toward the bottom of the tree than toward the top. Similar results were obtained from 6 small trees infested with the red scale (*Chrysomphalus aurantii*) fumigated with liquid hydrocyanic acid, thus differing from pot generated gas with which the killing effect is decidedly better toward the top of the tent. In this respect liquid hydrocyanic acid fumigation is advantageous, since the infestation of scale insects on large citrus fruit trees is usually most severe on the lower or more protected part of the trees, this being especially true of the purple scale.

The other advantages in favor of liquid hydrocyanic acid indicate that this new method will displace all others. "The cost of tent mending is almost entirely done away with, as liquid hydrocyanic acid is harmless to cloth. The treatment of small trees, frequently with such poor results in the past, can be performed with greater accuracy and corresponding certainty of results. Greater speed in tree treatment can be attained than previously, and it appears possible that the quantity of hydrocyanic acid required for scale-kill can be slightly reduced over that formerly required."

**[Codling moth investigations]** (*New Mexico Sta. Rpt. 1918, pp. 41–43*).—This is a brief statement of investigations carried on in continuation of those reported in a bulletin previously noted (E. S. R., 39, p. 765). The spraying work is reported in tabular form.

**The status of the oriental peach moth**, E. N. CORY (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 81–84*).—A brief statement of the occurrence of *Laspeyresia molesta* in Maryland, an account of which pest by Garman is given in a bulletin previously noted (E. S. R., 40, p. 756).

**Euclemensia bassettella, the Kermes parasite (Microlepidoptera, Tineoidea, Oeceophoridæ)**, A. H. HOLLINGER and H. B. PARKS (*Ent. News, 30 (1919), No. 4, pp. 91–100, pl. 1*).—The authors review the literature relating to this microlepidopteran, and report observations on its occurrence in Missouri and Texas. These are followed by an account of its biology at College Park, Tex.

The species is shown to be a Kermes parasite and not a gall feeder as previously reported. The larvæ have habits differing from those of other Kermes-infesting Lepidoptera. There appears to be but one generation a year, and no

parasites are known to attack any stage of this lepidopterous parasite of Kermes. In a few cases this parasite is said to have been abundant enough to materially reduce the coccid.

Practical application of the methods recently discovered for the control of the sprinkling sewage filter fly (Psychoda alternata), T. J. Headlee (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 35–41, pls. 2, figs. 4*).—A description of the application of the method recently described by the author and Beckwith (E. S. R., 40, p. 356).

The rose midge, E. R. Sasscer and A. D. Borden (*U. S. Dept. Agr. Bul. 778 (1919), pp. 8, figs. 2*).—The location of an infestation by *Dasyneura rhodophaga* of a rose house at Colgate, Md., in the fall of 1916, where it has caused an annual loss of from $4,000 to $6,000, led to the investigations here reported, which were conducted in cooperation with the Maryland Experiment Station.

The eggs of this midge, which are deposited just under the sepals of the flower buds or between the folded leaves of the leaf buds, hatch in 2 days and the larvæ immediately attack the buds, extracting the sap and eventually causing the petals and leaves to dry up and die. They reach maturity in from 5 to 7 days, and then work their way out of the buds and fall on and enter the ground, where they construct small silken cocoons in which to pupate. The adults appear in from 5 to 7 days and shortly thereafter commence oviposition. Thus under greenhouse conditions the life cycle is passed in from 12 to 16 days. At Colgate the larvæ were especially injurious from the latter part of May to early July and from early September to November 1. Roses, especially the hybrid teas, are apparently the only plants which it attacks.

Experiments are reported in which a number of formulas were tested. The results show that severe infestation can be controlled, if not entirely eliminated, in a comparatively brief period by careful application of tobacco dust on the soil and by the persistent nightly fumigation with tobacco, in the form of stems, nicotin papers, or one of the volatile nicotin preparations. Where earth walks are present it is advisable to spray the walks also with a 5 or 10 per cent kerosene emulsion. In the case of light infestations, the midge can be controlled by systematic nightly fumigations with tobacco fumes, which should be continued until all adults disappear, or by a careful application, at the proper season, of tobacco dust. "The most opportune time to apply the dust, if not accompanied with nightly fumigation, is during the latter part of October or the first three weeks of November, at which season the last generation of larvæ leaves the plants, enters the ground, and constructs overwintering cocoons. If dependence is placed on the dust alone, it is imperative that the application be so timed as to be on the soil before the larvæ seek winter quarters."

A list is given of 8 references to literature cited.

Ground beetles attacking crops in Mysore, L. C. Coleman and K. Kunhikannan (*Dept. Agr. Mysore, Ent. Ser. Bul. 5 (1918), pp. 16, pls. 2, figs. 2*).—Two ground beetles, namely, *Gonocephalum hofmannseggi* and *G. depressum*, are common in Mysore. The larvæ usually attack the roots of grass and the adults feed on decaying vegetation, but both may attack a summer crop like the potato. "The larvæ become pests of ragi (*Eleusine coracana*) in regions of deficient rainfall when the rains are delayed after sowing and the larvæ have not sufficient moisture to pupate. Crops like the potato grown in summer are also liable to attack, mainly by the adults which are attracted to it.

"The life history usually takes a year, the larval life being confined to the hot weather. The beetles emerging after the first heavy rains remain inactive until December, following when they commence to breed. A second brood is

possible in years when the first heavy showers are followed by a drought of two or three months.

"The past may be controlled by the collection of beetles in October by means of fresh weeds pulled out along with roots and spread along the bunds. There are three enemies, an acarid on the adult, a wasp, and an ichneumon on the larva. These are not efficient checks."

**The life cycle of Lachnosterna lanceolata**, W. P. HAYES (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 109–117, figs. 2*).—This is a report of studies conducted at the Kansas Experiment Station.

*L. lanceolata*, an important enemy of growing wheat in Kansas and Oklahoma, is regarded as most injurious in west central Texas. During the past few years grubs of this species have come into prominence every fall soon after wheat planting time in southern Kansas and northern Oklahoma, where they annually damage thousands of acres of young winter wheat. The species is practically confined to the region bounded on the west by the Rocky Mountains and on the east by the Mississippi River.

The eggs are laid singly or in small groups of three or four in clumps of soil at depths ranging from 1 to 7 in. during the months of June and July. They hatch in an average of 16 days (9 to 29) during July and August and the larvæ are present until June of the second year, giving a larval stage of slightly over 22 months. The pupæ, which occur in June and July, require an average of 13.8 days (8 to 20). Two full years are required for development, and in some cases where the larval stage is prolonged, three years may be required. The generations overlap each other so that all stages appear every season.

A list is given of 27 food plants upon which the species has been observed feeding in the fields.

*Sarcophaga prohibita* has been reared and is thought to be a true parasite of the pest. Rotation of crops is one of the best means of control thus far known.

**Biological notes on some flat-headed bark borers of the genus Melanophila**, H. E. BURKE (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 105–108*).—This paper deals with 12 species of flat-headed bark borers of the genus Melanophila that have been most destructive to forest trees. One species, *M. drummondi*, is of particular interest because it attacks the Sitka spruce, used in the manufacture of aeroplanes, while *M. genitilis*, *M. fulvoguttata*, and *M. californica* attack and kill some of the most important coniferous forest trees. Many sugar pine, yellow pine, Douglas spruce, true firs, true spruces, hemlocks, and larches have been killed at various times past and are now being killed by these pests.

**Comprehensive demonstration of Argentine ant control**, R. S. WOGLUM and A. D. BORDEN (*Cal. Citrogr., 4 (1919), No. 6, pp. 147, 171, figs. 3*).—It is pointed out that the very direct relation of the Argentine ant in the control of mealy bugs of citrus trees was demonstrated in 1915–16 in several infested orchards in the San Gabriel Valley of California during an investigation of the common mealy bug. The trees rid of this ant quickly became freed of mealy bugs and continued in a commercially clean condition, while trees frequented by ants remained severely infested.

The following formula for a poison sirup, the Barber formula (E. S. R., 35, p. 761) modified to meet arid conditions, is recommended by the authors after two years of successful use in combating the Argentine ant in more than 600 acres of citrus orchards: Granulated sugar 12 lbs., water (distilled) 10 pints, tartaric acid (crystallized) 0.25 oz. Boil 30 minutes, cool, add distilled water to allow for evaporation. Dissolve sodium arsenite (C. P. only)

0.75 oz. in hot water (distilled) 1 pint, cool. Add poison solution to sirup and stir well. Add to the poison sirup, honey (strained) 2 lbs. Mix thoroughly.

The cost of treating orchards for ant control is said to be cheaper than fumigation or spraying, and so low that the owner of infested property can ill afford not to avail himself of this method. In response to a petition of the citrus fruit growers in the Upland district, control measures against the citrophilus mealy bug were instituted and a campaign started in September, 1917, in an orchard infested by both mealy bugs and the ant. An inspection of the orchard in April, 1918, showed that 98 per cent of the trees of the first half treated were free of ants, and that 62 per cent of the part treated in November were clean. "The effectiveness of the sirup in the first demonstration was so apparent within a few weeks after its distribution that control efforts were rapidly extended to neighboring orchards and by the beginning of 1918 more than 150 acres had been treated. At the present time the ants have become not merely controlled but totally eradicated over this extensive area.

"This ant work has been extended during 1918 by more than 350 acres, practically all of which is in commercial control. An area of approximately 550 acres of citrus orchards practically in a solid block has been subjected to control of the Argentine ant within 16 months following the institution of a demonstration at Upland, and stands as an example of the possibilities in control and eradication of this insect through persistent and concerted action of fruit growers."

## FOODS—HUMAN NUTRITION.

**The antiscorbutic value of cabbage.—I, The antiscorbutic and growth-promoting properties of raw and heated cabbage,** E. M. Delf (*Biochem. Jour., 12 (1918), No. 4, pp. 416–447, pls. 2, figs. 5*).—The author reviews the work of Holst and Frölich (E. S. R., 27, p. 567) on the antiscorbutic value of fresh raw cabbage and of cooked cabbage, and reports an extensive study of the same subject, using guinea pigs as the experimental animals.

The standard basal diet was a mixture of rolled oats and bran ad libitum with water and, in cases where the rations of cabbage were small, with a daily supplement of 60 cc. of milk autoclaved for one hour at 120° C. The cabbage was given in the green leaf.

From the series of experiments with raw cabbage the conclusion is drawn that under the conditions of the experiment a 1 gm. ration of fresh cabbage may be regarded as the minimum for protection from the symptoms usually diagnosed as scurvy. On a 0.5 gm. ration, well-marked symptoms of scurvy were obtained. Apparently satisfactory growth and health were obtained with from 1.5 to 5 gm. when 60 cc. autoclaved milk was added daily to the diet, although suggestions of soreness during life and the histology of the bone cartilage junctions indicated a condition of incipient scurvy. With a ration of 30 gm. of fresh cabbage, normal growth took place with an increase of about 100 per cent in 90 days.

A comparative study of the antiscorbutic value of cabbage after exposure to various temperatures for different intervals of time showed that the antiscorbutic factor is exceedingly sensitive to temperatures below 100°. The rate of destruction, however, is increased only about threefold for an increase in temperature of 30 to 40°, as shown by the fact that 5 gm. of cabbage cooked for one hour at 60° was about equal in antiscorbutic value to 5 gm. of cabbage cooked at 100° for 20 minutes and to 1 gm. of raw cabbage. It is pointed out that this low temperature coefficient is in opposition to the view that the antiscorbutic factor is a complex protein or an enzym-like substance.

In applying the foregoing results to methods of cooking vegetables, the author points out that slow cooking at a low temperature is much more deleterious than more rapid cooking at a high one, and that, consequently, as far as antiscorbutic value is concerned, the longer time needed in a fireless cooker is a great disadvantage in the case of green vegetables, such as cabbage. Evidence is also given that vegetables should be steamed rather than boiled in water, and if boiled should be boiled in water only, the addition of either acid or alkali to the water increasing the loss of antiscorbutic vitamins.

In experiments in which larger rations of cabbage were given heated to temperatures from 100 to 130° for periods of one to two hours, the destruction of antiscorbutic properties, though extensive, was less complete than was to be expected from the results at lower temperatures. A suggested explanation of this discrepancy is that the antiscorbutic value of a diet may be enhanced and may show greater heat stability when the antiscorbutic factor and the growth fat-soluble factor are derived from the same foodstuff. The greater heat stability of the fat-soluble factor is also shown from the fact that heating for one to two hours at temperatures from 100 to 120° produced only a slight effect.

The article concludes with an appendix by F. M. Tozer on the histological diagnosis of experimental scurvy, with diagrammatic drawings made from histological preparations of the rib junctions of animals used in the experiments described and which demonstrate the more important histological changes observed in animals suffering from scurvy in varying degrees. The diagnosis made from the histological preparation independently of the diagnosis of the condition seen during the life of the animal or in post-mortem examination in most cases tallied closely with the latter.

**The antiscorbutic value of cabbage.—II, The effect of drying on the antiscorbutic and growth-promoting properties of cabbage,** E. M. Delf and R. F. Skelton (*Biochem. Jour., 12 (1918), No. 4, pp. 448–463, figs. 2*).—From feeding experiments similar to those noted above, it was found that there was a loss in antiscorbutic properties of more than 93 per cent when cabbage was dried at a low temperature (60° C.) and stored subsequently for two to three weeks at laboratory temperatures. This loss increased with prolonged storage until at the end of three months nearly all the protective value of the fresh material was lost. By plunging the cabbage into boiling water before drying, the residual amount of antiscorbutic factor was distinctly greater, indicating that killing the cells by heat before drying is beneficial in lessening the amount of destruction taking place during drying.

In the drying and storing of the cabbage there was also found to be a decided destruction of the fat-soluble growth-promoting factor, which was estimated at 86 per cent after only two weeks' storage.

The results in general are thought to agree with those of Holst and Frölich (E. S. R., 27, p. 567), and of Givens and Cohen (E. S. R., 40, p. 172).

**Utilization of Burma beans for human nutrition,** Rothea (*Ann. Falsif., 11 (1918), No. 121–122, pp. 361–369*).—Determinations of the hydrocyanic acid content of Burma beans and of the water in which they have been soaked and cooked are reported, which indicate that in the processes of soaking and boiling usually employed about seven-eighths of the hydrocyanic acid is removed.

The author concludes that Burma beans, even those containing 0.03 per cent of hydrocyanic acid, can be consumed by adults without danger, provided the beans have been soaked in a large volume of water from 12 to 24 hours and boiled for 3 hours in a fresh quantity of water. In no case should the water in which soaking and boiling have taken place be used. The use of these beans in hospitals and for making bean broth for infants is considered inadvisable.

**Moisture in wheat and mill products**, J. H. Shollenberger (*U. S. Dept. Agr. Bul. 788 (1919), pp. 12, figs. 2*).—The moisture requirements of wheats for milling purposes, the amount of moisture added during tempering, the moisture content of wheat and various streams of mill stock, and the loss of moisture during grinding, as well as related subjects, were taken into account in this experimental study. The results are summarized as follows:

"The decrease in the moisture content of the various roll streams from the head to the tail of the milling process was closely related to the amount of water added to the wheat during tempering.

"It appeared that very little of the moisture added to the wheat during tempering penetrated farther than the pericarp or outer coatings of the kernel. The moisture content of the better grades of flour milled, irrespective of the amount of water added during tempering, closely corresponded to the percentage of moisture contained in the untempered wheat. The amount of water added in tempering compensated for the evaporation of moisture during milling only in the case of one of three mills examined."

**Influence of electrolytes upon the viscosity of dough**, L. J. Henderson, W. O. Fenn, and E. J. Cohn (*Jour. Gen. Physiol., 1 (1919), No. 4, pp. 387–397, figs. 5*).—The effect of H-ion concentration and of salts upon the viscosity of dough was determined by measuring the resistance of a definite amount of dough to stirring when packed in a torsion viscosimeter. It was found that with variation in H-ion concentration viscosity passes through a minimum a little on the acid side of pH 5. The addition of a small amount of salt to dough diminished viscosity, while as the concentration of the salt increased there was commonly a later rise in viscosity. Of the salts studied, the sulphates of sodium and magnesium had the most marked effect. The influence of salts upon viscosity was found to vary with the H-ion concentration. At a more acid range of reaction sodium chlorid depressed the viscosity greatly, while calcium chlorid lowered the viscosity in a less acid range.

The results are thought to indicate that in bread making the action of acids, bases, and salts, perhaps with the exception of potassium bromate, is favorable chiefly through the effect upon viscosity, and that any influence upon the activity of yeast is apparently a matter of secondary importance.

**Compressed yeast as food for the growing organism**, P. B. Hawk, H. R. Fishback, and O. Bergeim (*Amer. Jour. Physiol., 48 (1919), No. 2, pp. 211–220, figs. 2*).—Feeding experiments with rats to determine the growth-promoting porperties of baker's yeast (Fleischmann) are reported.

The addition of the compressed yeast to the extent of 5 per cent of the dried yeast by weight of the total diet caused an immediate and pronounced increase in body weight. This increase was found to be more rapid and pronounced when the diet contained casein than when the protein of the diet was furnished by lean meat. Heating to 105° C. did not destroy the growth-promoting properties of the yeast.

**Cheese poisoning: A toxicogenic bacillus isolated from cheese**, W. Levin (*Jour. Lab. and Clin. Med., 2 (1917), No. 11, pp. 761–784*).—The morphological and cultural characteristics, pathogenicity, and toxin formation are described of an organism known to have produced several cases of cheese poisoning. The organism, while belonging to the colon group as proved by its morphological and biochemical reactions and agglutination tests, differed from the true colon bacilli in its ability to form a soluble thermostabile poison or toxin of unknown chemical composition.

**Toxin formation by a variety of B. botulinus when cultivated aerobically under various conditions: Its possible production in the animal body**, L. P. Shippen (*Arch. Int. Med., 23 (1919), No. 3, pp. 346–361*).—A study conducted at

the Bureau of Chemistry of the U. S. Department of Agriculture is reported of the toxin production of a strain of *Bacillus botulinus* under unfavorable conditions, such as might occur within and without the animal body in nature.

The organism, isolated from cottage cheese that had caused an epidemic diagnosed post-mortem as botulism, was found to be a distinct variety of the *B. botulinus* of van Ermengem, differing from it in the following particulars: It is more toxic for rabbits and less toxic for cats. It grows and produces toxin at 37° C. and in sugar-free media of acidity of +3. It does not lose its ability to produce toxin after being exposed to light for two and one-half months and being dried on paper for 22 days. In symbiosis with a yeast it can be cultivated aerobically on agar slants. Grown with *B. coli* and a yeast in milk or with *Micrococcus aureus* in extract broth at 38 to 39° under aerobic conditions it produces death when ingested by a rabbit.

It is thought that the toxin produced under certain conditions by this strain might cause death by embolus or hemorrhage in the brain, accompanied by but few preliminary symptoms of a minor character, but that there always remains the possibility of the organism growing in the body and producing its toxin slowly and under altered conditions, thereby causing a different syndrome from that seen when the toxin is ingested. The author is of the opinion that some cases of forage poisoning may be due to certain strains of *B. botulinus*.

**Digestibility of some by-product oils,** A. D. Holmes (*U. S. Dept. Agr. Bul. 781 (1919), pp. 16*).—This continues the experimental study of digestibility of vegetable fats and oils previously noted (E. S. R., 39, p. 591). Digestion experiments were made with six oils, all by-products of considerable interest in connection with the oil industry in general.

The coefficients of digestibility of the oils are given as 98.4 per cent for apricot-kernel oil, 98 per cent for cherry-kernel oil, 98.2 per cent for melon- (cantaloup) seed oil, 96.6 per cent for peach-kernel oil, 98.2 per cent for pumpkin-seed oil, and 95.8 per cent for tomato-seed oil. This indicates that these oils are very well assimilated by the body and possess a nutritive value equal to that of other better-known edible oils, such as cottonseed, corn, peanut, coconut, soy bean, and olive oils. In general the experiments indicate that as far as tolerance and assimilation are concerned all six of these oils, which at present are practically unutilized, are wholesome, nutritious foods, and should prove satisfactory for edible purposes.

**The twenty-third report on food products and the eleventh report on drug products, 1918,** E. M. Bailey (*Connecticut State Sta. Bul. 210 (1919), pp. 177–242*).—In addition to a number of proprietary remedies, toilet preparations, and other drugs, the following food products were examined and results discussed: Tea, fats and oils (cooking fats, olive oil, butter, oleomargarin, and nut margarin), cereal products (substitute flours, breakfast foods, and health foods, etc.), fruit juices, carbonated beverages, dried eggs and egg substitutes, milk, cream, sausage, vinegar, wine, nonalcoholic beverages, and sirups. A number of foods were also tested for the presence of saccharin, suspected injurious foreign substances, etc.

"Forty-four samples of market teas, mostly of cheaper grades, have been examined. . . . Hot water extract exceeds 40 per cent in 7 cases and exceeds 35 per cent in 43 cases of the total of 44. Ether extract is lower in black tea than in green tea, as would be expected from the fact that chlorophyll, which comprises a large portion of such extract, is largely destroyed in the process by which black tea is made."

In discussing the results of the examination of margarins and nut margarins, it is stated that "nut margarins differ from oleomargarin in that they do not

contain the fat of slaughtered animals. They are chiefly composed of coconut fat with admixtures of other vegetable fats or oils to give the proper consistency. Peanut or cottonseed oils are used for this purpose. The fats are ripened with milk to which a culture of lactic acid-forming bacteria has been added, in order to impart the flavor of butter. They are quite perishable products and manufacturers do not encourage jobbers to keep large quantities on hand, preferring to have them supplied with fresh material. Benzoate of soda is used as a preservative in some cases, which is legal, provided the amount does not exceed 0.1 of one per cent, and is so stated. The color dispensed with nut margarins . . . [was] found to be annatto." The results of the analyses of 8 samples of nut margarin varied considerably. However, the average was found to be as follows: Moisture 10.99 per cent, protein (N×6.25) 1.39 per cent, fat 84.76 per cent, free fatty acids, as oleic, 0.61 per cent, ash 2.85 per cent, refractometer reading at 40° C. 38.6, and Reichert-Meissel number 6.63.

**Drugs and foods,** C. D. Woods (*Maine Sta. Off. Insp., 91 (1919), pp. 20*).—Data regarding examinations of butter, ice cream, molasses, opened clams and oysters, and a large number of drug products are included in this report. In commenting on the work with ice cream it is stated that the standard was placed high, and that for the most part there had been intelligent desire on the part of ice cream manufacturers to maintain the standard.

**Animal calorimetry.—XV, Further experiments relative to the cause of the specific dynamic action of protein,** H. V. Atkinson and G. Lusk (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 415–427*).—In continuation of work previously noted (E. S. R., 39, p. 772), the authors have investigated further the specific dynamic action of the proteins. In the experiments reported it is shown that 200 cc. of 0.4 per cent hydrochloric acid may slightly increase the metabolism of a dog, that aspartic acid, asparagin, and succinic acid exert no specific action upon metabolism, and that acetamid is not deaminized by the dog and does not increase its heat production.

These results appear to confirm the conclusion previously drawn (E. S. R., 33, p. 755) that the processes of deamination and urea formation have nothing to do with the specific dynamic action of protein, and to refute the conclusions of Grafe,[1] who attributes the stimulating action of proteins to the amino groups.

**The reason for the specific dynamic action of protein,** W. E. Burge (*Amer. Jour. Physiol., 48 (1919), No. 2, pp. 133–140, figs. 3*).—Experimental evidence is given to show that the introduction of small amounts of glutamic, aspartic, and succinic acids, asparagin, and acetamid produces no increase in catalase while large amounts do produce an increase in catalase. It is pointed out that this is in keeping both with the observation of Atkinson and Lusk noted above, that small amounts of these substances do not produce an increase in catalase and with Grafe's observation [1] that large amounts increase oxidation.

It is also shown that the amino group in the protein molecule renders protein, or meat, a more effective stimulant to catalase production and hence to heat production than fat and that the glycerin radical in the fat molecule renders fat more effective than sugar.

**Accessory factors in the nutrition of the rat,** A. Harden and S. S. Zilva (*Biochem. Jour., 12 (1918), No. 4, pp. 408–415, figs. 7*).—Feeding experiments to test the adequacy for rats of diets lacking in fat-soluble A, water-soluble B, and the antiscorbutic factor, respectively, are reported from which the conclusions are drawn that an antiscorbutic does not fulfill the physiological function of

[1] Deut. Arch. Klin. Med., 118 (1915), No. 1.

fat-soluble A when it replaces it in the diet, and that rats subsisting on a diet containing the antiscorbutic as well as the water-soluble and fat-soluble factors grow better than rats on a diet from which the antiscorbutic factor is absent.

The authors confirm the observation of McCollum and coworkers (E. S. R., 38, p. 568) and of Drummond (E. S. R., 38, p. 503) that by depriving rats of the antineuritic factor a dietetic deficiency is brought about, as a result of which neuritic lesions are produced in the animal resulting fatally if the diet is not rectified in time.

**The influence of internal secretions on the formation of bile**, A. W. Downs and N. B. Eddy (*Amer. Jour. Physiol., 48 (1919), No. 2, pp. 192–198*).—Evidence is given from the use of dogs and cats as experimental animals that the amount of bile secreted is increased by secretin, decreased by adrenalin and by mammary, orchic, ovarian, pancreatic, and thymic gland substances, and is not affected in a constant or definite manner by the substances of the spleen and thyroid gland.

**Observations on the catalytic power of blood and solid tissue**, F. C. Becht (*Amer. Jour. Physiol., 48 (1919), No. 2, pp. 171–191, fig. 1*).—The author reports the results of investigations of the catalase content of blood and tissues under different conditions by the use of a method which in the case of blood is said to give results accurate to within 5 per cent in most cases. Accurate results could not be obtained in the case of solid tissues, the error being from 5 to 20 per cent.

The catalytic power of the blood was found to vary from 100 to 1,000 per cent in animals of the same species under the same conditions and to vary widely in the blood of animals of different species. The activity was confined to the corpuscle, and was not influenced by the oxygen-carrying power of the blood. Thyroid feeding, contrary to the findings of Burge et al. (E. S. R., 38, p. 870), decreased instead of increased the catalytic power of the blood. There was a slight increase in the catalytic activity of the blood during ether anesthesia, which is also contrary to the results of Burge.

The author concludes that since the catalytic power of the blood varies between such enormously wide limits "we do not believe that the catalases can be particularly important, and hence do not believe that a study of catalases can possibly explain the mysteries of the processes of oxidation."

**Method of estimating energy expenditure by indirect calorimetry**, E. P. Cathcart (*Jour. Roy. Army Med. Corps, 31 (1918), No. 5, pp. 339–352, figs. 4*).—This article includes a theoretical discussion of the principles underlying indirect calorimetry and a detailed description of the procedure involved in the Douglas bag method of estimating energy expenditure by indirect calorimetry. Diagrams are given of the Douglas bag and of the Haldane apparatus for analyzing the sample of air.

## ANIMAL PRODUCTION.

**The endocrine organs.—An introduction to the study of internal secretion.** E. A. Schäfer (*London and New York: Longmans, Green & Co., 1916, pp. IX+156, figs. 104*).—This monograph is designed for those who require a somewhat more elaborate treatment of the ductless glands than is afforded by the ordinary text-book of physiology. The thyroids and parathyroids, adrenal capsules, and the pituitary body are dealt with in some detail, while the thymus, the pineal gland, the mucous membrane of the duodenum, the pancreas,

the testicle, the ovary, the corpus luteum, the uterus, the mammary gland, and the placenta receive more summary treatment. The illustrations are mainly tracings showing the influence of extracts on muscular action and drawings of histological preparations.

**The placenta regarded as a gland of internal secretion**, R. T. FRANK (*Surg., Gynecol., and Obstet., 25 (1917), No. 3, pp. 329–331*).—A review of the literature is given and a statement made of experimental results secured by the author.

Injection of placental extract caused great increase in functional activity of the mammary gland and the uterus of rabbits. The extract was found to have chemical characters and physiological effects closely resembling those of corpus luteum extract. It is suggested that the placenta does not secrete a hormone of its own but merely acts as a storehouse for corpus luteum secretion, especially during the latter part of pregnancy.

**Histological study of ovaries engrafted on castrated male guinea pigs and removed at the onset of lactation**, M. ATHIAS (*Compt. Rend. Soc. Biol. [Paris], 79 (1916), No. 12, pp. 553–556*).—The author has examined histologically 8 guinea pig ovaries that had been grafted under the skin of young castrated males of the same species. After an interval of time the mammary gland of the male became functional. The four grafts removed during the first three days of lactation are reported on here. Interstitial gland tissue and numerous mature and atretic follicles were found, but no true corpora lutea.

**On the causes responsible for the developmental progress of the mammary glands in the rabbit during the latter part of pregnancy**, J. HAMMOND (*Proc. Roy. Soc. [London], Ser. B, 89 (1917), No. B 622, pp. 534–546, pl. 1*).—As a result largely of the work of Ancel and Bouin (E. S. R., 21, p. 669), the author regards it as established that the corpus luteum provides the stimulus for the growth of the mammary gland during the early stages of pregnancy. His object in the present paper is to report investigations dealing with the development of the mammary gland during the glandular phase, which in rabbits begins about the sixteenth day of pregnancy.

Contrary to accepted belief the corpus luteum of pregnant rabbits was found not to become atrophied during the latter part of gestation, but to maintain its size even into the period of lactation. In a series of "pseudo-pregnant" rabbits, i. e., females made to ovulate by coitus with vasectomized males, the corpora lutea and mammary glands developed as in pregnant individuals until the sixteenth day after coitus and then decreased in size. By operative mutilations of the uterus of certain pseudo-pregnant does, the author caused the development of masses of decidual cells identical in appearance with the maternal placenta. In such animals the corpora lutea and the mammary gland followed the same course as in ordinary pseudo-pregnant individuals. Pregnant females, from which the fetuses but not the maternal placentæ were removed by operation on the thirteenth to fifteenth days of gestation, also showed atrophy of corpora lutea and mammary glands. It is held that the presence of embryos is necessary for continued existence of corpora lutea, and that the presence of the latter stimulates the mammary gland to complete development.

**The cyclic changes in the mammary gland under normal and pathological conditions**, L. LOEB and C. HASSELBERG (*Jour. Expt. Med., 25 (1917), No. 2, pp. 285–321*).—Two studies are presented based upon the histological examination of the mammary gland in normal guinea pigs and those that had been subjected to various operations.

I. *The changes in the nonpregnant guinea pig* (pp. 285–304).—A definite 15 to 19 day cycle was found in the activity of the mammary gland of the non-

pregnant guinea pig, corresponding to the cycle in the ovary and uterus. Cell division and other proliferative phenomena are at their maximum during the period of heat and ovulation, and at their minimum from the sixth to about the fifteenth day after ovulation. The presence of a functioning corpus luteum seems to inhibit proliferation.

II. *The changes in the pregnant guinea pig, the effect of the lutein injections, and the correlation between the cycle of the uterus and ovaries and the cycle of the mammary gland* (pp. 305–321).—In 26 normal guinea pigs the mammary gland was examined during different periods of pregnancy. Proliferation becomes regular only after the twenty-fourth day, when gestation is about two-fifths over, and continues apparently until lactation becomes well established. When abortion took place not more than 15 days before term, the gland changed from a proliferating to a secreting organ. In cases where it was possible to remove the ovaries in the early stages without causing abortion, no proliferative changes occurred. Extirpation of the corpora lutea during pregnancy induced a new ovulation and with it the primary proliferation in the mammary gland. Intraperitoneal injections of lutein (from the cow) did not affect proliferation.

**The relation of the ovary to the uterus and mammary gland from the experimental aspect,** L. Loeb (*Surg., Gynecol., and Obstet., 25 (1917), No. 3, pp. 300–315, fig. 1*).—In this paper the author presents a general review of the literature and an interpretation of the observations of others in the light of his own publications, some of which have been previously noted (E. S. R., 27, p. 174).

Ovulation in some species of mammals is accompanied by marked degeneration of the larger follicles of the ovary. In forms where the production of corpora lutea is not periodic but initiated by the act of copulation, the cells surrounding the degenerating follicles enlarge and assume a glandular appearance. It is suggested that the use of the term interstitial gland be restricted to glandular tissue of this type. The presence of a uterine placenta hinders rupture of the corpus luteum of pregnancy. The existence of a corpus luteum prevents ovulation in most mammals. Corpora lutea have been produced experimentally without ovulation in rabbits and guinia pigs by cutting a mature follicle. Heat is probably brought about by absence of a corpus luteum and presence of mature follicles in the ovary. The corpus luteum does not interfere with the maturation of follicles.

The relation between the ovary and the mammary gland has not been completely analyzed. During heat and subsequent to ovulation, the gland grows by proliferation of cells. After the corpus luteum develops, these changes cease and the gland secretes milk. The response of the gland to corpus luteum extracts varies in different animals.

**On the behavior of the mammalian ovary and especially of the atretic follicle towards vital stains of the acid azo group,** H. M. Evans (*Proc. Soc. Expt. Biol. and Med., 13 (1916), No. 4, pp. 80, 81*).—By administering dyes of the acid azo group to the female mammal—dogs being apparently the chief subject of experiment—the author finds that he can identify those ovarian follicles that are about to undergo atresia, but which have not yet shown any morphological changes. The granular cells of follicles in the preliminary stage of retrogression take up the dye and store it as cytoplasmic granules. "The conditions which bring about this reaction are typically seen in the atresia which always overtakes the next succeeding crop of Graafian follicles after fertilization of the preceding crop, but this behavior is not repeated further in

the pregnancy, where now other forms of atresia may come in. Enough warrant consequently exists for the recognition of types of atresia the occurrence of which is related with certainty to what one may broadly term the cycles undergone by the ovary in general."

The macrophages which invade the zona pellucida of the atretic ovum also react to these dyes but in a different manner.

**The noneffect of corpus luteum preparations on the ovulation cycle of the rat**, G. W. Corner and F. H. Hurni (*Amer. Jour. Physiol., 46 (1918), No. 4, pp. 483–486*).—It is stated that unpublished work of J. A. Long and H. M. Evans shows that the ovulation cycle of rats varies from 4 to 11 days but is fairly constant for a particular female. The corpora lutea persist several weeks, during which time the cycles continue and new corpora are produced.

During the first 4 days following parturition rats were injected daily by the authors with one of Evans's intravitam stains known to color the existing corpora lutea an intense blue. On alternate days thereafter 10 of the rats received doses of commercial extract of corpus luteum from the cow and on the twenty-fifth day were killed. Their ovaries showed from 13 to 30 unstained corpora, about the same number as that found in control animals receiving only the injection of dye. The results are contrasted with those of Pearl and Surface (E. S. R., 32, p. 671) who found corpus luteum extract to reduce ovulation in laying hens.

**Corpus luteum and the periodicity in the sexual cycle**, L. Loeb (*Science, n. ser., 48 (1918), No. 1237, pp. 273–277*).—In this discussion the author points out that the presence of the living corpus luteum of pregnancy does inhibit ovulation, and that this fact can not be disposed of by experiments like those of Corner and Hurni and some of his own in which injections of dried lipoid-free lutein derived from a different species failed to modify ovulation.

**Continuous and discontinuous variations and their inheritance in Peromyscus**, F. B. Sumner (*Amer. Nat., 52 (1918), Nos. 616–617, pp. 177–208; 618–619, pp. 290–300; 620–621, pp. 439–454, figs. 13*).—This paper treats of differences in structure (weight, body length, tail length, foot length, ear length, and number of caudal vertebræ) and in pigmentation (intensity, distribution) of four geographical races of deer mice of the genus Peromyscus occurring in California. That the differences are hereditary is shown by their persistence under changed environment and by the magnitude of the coefficients of correlation between parents and offspring. Hybrids between the races are found to be intermediate in character and just as variable in the $F_1$ as in the $F_2$ generation. These subspecific characters, it is held, exhibit continuous variation and blended inheritance, and the author puts them in a class distinct from certain "mutations" that have occurred in his cultures, notably a pale, spotted, red-eyed form and a yellow form that have proved to be simple Mendelian recessives to the wild type. The author insists that it rests with the "pan-Mendelians" to show that these two types of variation belong to a single category, that of discontinuity.

**The factors for yellow in mice and notch in Drosophila**, W. A. Lippincott (*Amer. Nat., 52 (1918), No. 618–619, pp. 364, 365*).—This note calls attention to the possibility that a factor might be dominant to its allelomorph in one of its manifestations and recessive in another. The yellow mouse case could be interpreted in this way without postulating two separate but completely linked factors, yellow and lethal, as is done by Ibsen and Steigleder (E. S. R., 38, p. 573). A similar explanation offered by T. H. Morgan for some Drosophila results is cited.

**Report on commercial feeding stuffs, 1918,** E. M. BAILEY (*Connecticut State Sta. Bul. 212 (1919), pp. 353–395*).—Report is made on samples of feeding stuffs collected by the station's agent during December, 1918, and January, 1919, and those submitted by the dairy commissioner and private individuals during the year. Proximate analyses are published of cottonseed meal, cottonseed feed, linseed meal, wheat bran, wheat mixed feed, wheat middlings, rye feed, rye middlings, barley feed, barley mixed feed, ground barley, corn gluten feed, hominy feed, yellow hominy feed, corn feed meal, brewers' dried grains, distillers' dried grains, dried beet pulp, velvet bean feed, peanut-oil meal, copra cake meal, and various proprietary stock feeds, calf meals, and poultry feeds. Reports on condimental foods and remedies are also included.

**The international trade in feeding stuffs** (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 4, pp. 467–510; 8 (1917), No. 4, pp. 489–551*).—Statistics are given following the plan previously noted (E. S. R., 33, p. 664). They show the production, foreign trade of the various countries, and prices of residues of the milling, oil, sugar, and brewing and allied industries, also of residues of animal origin. Extensive bibliographies are included.

**International trade in concentrated cattle foods,** G. DE BRANCION and E. VAN DE WEYER (*Internat. Inst. Agr. [Rome], Internat. Trade Concent. Cattle Foods, No. 4 (1918), pp. 72*).—The information noted above is published in another form and according to a slightly different plan.

**Steer nutrition** (*Georgia Sta. Rpts. 1917–18, p. 13*).—In the course of digestion trials, it was found that the time required for feed residues to pass through the alimenary tract of a steer varied from 2.9 to 5.2 days, finely divided material being excreted in the shortest time. Rapidity of passage was associated with lowered digestibility in the case of crude fiber.

**Range cow maintenance project on Russian thistle silage** (*New Mexico Sta. Rpt. 1918, pp. 62, 63*).—Silage made exclusively of Russian thistle was found to have a disagreeable odor when fresh and to deteriorate rapidly upon exposure to the air, but silage made from a mixture of Russian thistle and corn meal (100:1) proved satisfactory and maintained the body weights of 5 range cows fed no other feed for 20 days. At the end of the test each cow was eating about 40 lbs. per day. It is suggested that a few stalks of corn or sorghum might be substituted for the corn meal.

**Milk ration for dairy calves** (*North Dakota Sta. Rpt. 1917, pp. 18, 19*).—It was found that a group of 4 calves, each fed 16 lbs. of skim milk and 1 lb. of boiled flaxseed per day, was essentially equal in thrift and general development at the age of 6 months to another group fed 8 lbs. of whole milk and 8 lbs. of skim milk per head daily. Both lots were fed whole milk exclusively until 3 weeks old, and began to have grain added to the milk ration when 5 weeks old.

**Quantity and composition of ewes' milk: Its relation to the growth of lambs,** R. E. NEIDIG and E. J. IDDINGS (*Jour. Agr. Research [U. S.], 17 (1919), No. 1, pp. 19–32*).—This paper from the Idaho Experiment Station furnishes individual data for 18 ewes (3 typical specimens each from 6 breeds) as to amounts of milk produced and its specific gravity and chemical composition on the tenth, twentieth, thirtieth, fortieth, and fiftieth days after parturition and the weights of the ewes and their lambs on these days. The amounts of milk were determined by weighing the lambs before and after suckling. The milk samples for analysis were secured by milking one side of the udder by hand while a lamb suckled the other side. The breed averages for milk yield and chemical composition are summarized in the following table:

*Average quantity and composition of ewe's milk by breeds.*

| Breed. | Average daily milk yield. | Specific gravity. | Composition of milk. | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Casein. | Albumin. | Non-protein nitrogen. | Fat. | Lactose. | Ash. |
| | *Gm.* | | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* |
| Hampshire | 2,170 | 1.032 | 3.06 | 0.74 | 0.070 | 7.1 | 4.73 | 0.78 |
| Cotswold | 1,558 | 1.033 | 3.10 | .74 | .065 | 7.7 | 4.78 | .82 |
| Shropshire | 1,532 | 1.033 | 3.47 | .77 | .070 | 8.1 | 4.50 | .88 |
| Rambouillet | 1,495 | 1.036 | 3.60 | .81 | .078 | 7.8 | 4.77 | .85 |
| Lincoln | 1,258 | 1.027 | 3.08 | .77 | .065 | 8.1 | 4.76 | .76 |
| Southdown | 1,238 | 1.033 | 3.45 | .79 | .066 | 7.5 | 4.70 | .91 |

Some of the ewes raised two lambs and some only one, but in spite of this disturbing element, which makes exact comparisons difficult, it appears that the most important factor in securing growth of lambs is amount and not quality of milk.

**Green forage crops for lambs**, J. W. HAMMOND (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 112–116, figs. 3*).—Three experiments at the Southeastern Test Farm at Carpenter, Ohio, to compare blue grass pasture with annual forage crops for fattening lambs are reported. It is stated that the blue grass was inferior to that found in the best blue grass areas owing to the nature of the soil in the experimental plats. In experiment 1, in which rape was the annual crop used, the lambs weighed about 48 lbs. per head at the start and were kept on pasture 131 days. The daily gain per lamb was 0.11 lb. for the blue grass lot and 0.113 lb. for the rape lot, but the gains per acre were, respectively, 48 and 242 lbs. In each of the other experiments, one of the two lots grazed rye, red clover, and rape in succession, the rape period being the longest. The lambs in these experiments had an initial weight of about 33 lbs. In experiment 2, the average daily gain per head for the blue grass lot was 0.192 lb. during 153 days, and for the lot on annual crops 0.23 lb. during 132 days. In experiment 3, both lots grazed 160 days; the average daily gain with blue grass being 0.121 lb. per head and with the annual crops 0.161 lb. A test with rape at Wooster is also cited in which lambs made a gain of 576 lbs. per acre during 83 days' grazing.

"The gains produced by these annual forage crops indicate that their more extensive use in lamb production would be found advantageous, either to replace or supplement permanent pastures. More labor is required than where permanent pastures are used, but in sections of the State where land is relatively high in price the greater production per unit of land may be more than sufficient to offset the greater labor cost.

"By providing good pasture for lambs after weaning and by using an annual pasture crop, a setback in growth can frequently be avoided and the lambs can be made ready for market at an earlier age. This latter consideration is important, as it is advantageous to the corn-belt farmer, in most instances, to get his lambs on the market in good flesh early in the autumn so they will not have to compete with the heavy runs of range lambs."

**[Experiments with swine]**, F. A. HAYS (*Delaware Sta. Bul. 122 (1918), pp. 21–25*).—Some results of feeding tomato waste and garbage to swine are reported. A lot of 5 pigs weighing about 136 lbs. per head were fed hominy feed and tankage in a self-feeder for 40 days and made an average daily gain of 1.25 lbs. per head at an expenditure of 5 lbs. of hominy feed and 0.1 lb. of tankage per pound of gain. A comparable lot fed similarly but with access to tomato waste gained 1.56 lbs. per head per day and consumed about 4 lbs.

of hominy feed, 0.2 lb. of tankage, and 1.9 lbs. of waste per pound of gain. With tankage at $80 and hominy feed at $54 per ton, it is estimated that the tomato waste had a value for feeding purposes of $20.74 per ton. Two lots of 6 pigs, each weighing about 80 lbs., were fed shelled corn, tankage, and linseed meal free choice for 80 days. One lot gained at the rate of 0.68 lb. per head per day; the other, which was given 12.5 lbs. of garbage daily in addition, made a daily gain of 1.24 lbs. per head. Ten lbs. of garbage effected a saving of about 2.7 lbs. of corn, 0.1 lb. tankage, and 0.1 lb. linseed meal.

Records are also published of the feeding of another lot of pigs on garbage (but without a check lot), and of a lot of 6 gilts fed middlings, bran, tankage, corn, corn-and-cob meal, hominy feed, and milk for 140 days. A financial statement is given of the cost of feeding and caring for pregnant brood sows for 6 months during the winter of 1917–18.

**Alfalfa hay for brood sows** (*North Dakota Sta. Rpt. 1917, pp. 17, 18*).—Ten 310-lb. brood sows fed crushed barley and bran (2:1) for 65 days were compared with 40 fed as much alfalfa as they would eat and a limited amount of the grain mixture. The former group consumed a 1.8 per cent and the latter a 1.2 per cent grain ration. It is computed that 1.4 lbs. of alfalfa replaced a pound of the grain. The litters from the alfalfa-fed sows were as large and as uniform as those from sows carried on full grain ration.

**Rape pasture for swine,** W. L. Robinson (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 109–111, fig. 1*).—Some pasture tests with hogs are briefly reported. Pigs weighing about 95 lbs. per head were kept on pasture for 76 days, with shelled corn as supplemental concentrate. Compared with dry lot feeding of corn an acre of blue grass effected a saving of 10.4 bu. of corn, an acre of second-growth clover 19.8 bu., and an acre of rape 30.3 bu. In a test of rape pasture in comparison with dry lot feeding of corn and tankage, pigs weighing about 44 lbs. were grazed for 119 days. With both corn and tankage as supplements to the pasture, the saving per acre is estimated as 42.8 bu. of corn and 266 lbs. of tankage, assuming a carrying capacity of 20 pigs per acre. With corn alone as supplement and an assumed carrying capacity of 18 pigs, the saving is computed as 23.4 bu. corn and 789 lbs. of tankage.

General directions are given for the use of rape pasture for swine. "An acre of rape pasture may be estimated to carry 18 to 24 full-fed spring pigs from June until the close of the grazing season. If the concentrate ration is limited to three-fourths of a full feed an acre will carry from 12 to 15 pigs." It is suggested that rape be seeded in corn that is to be hogged down so as to provide a more economical ration.

**Feeding mineral supplements to pigs,** J. O. Halverson (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 121–123, fig. 1*).—Several mixtures containing precipitated bone flour were tested in various ways as mineral supplements to a hog ration consisting of ground corn, linseed meal, and wheat middlings (7:1:1) and a small amount of common salt. All the 20 pigs used made consistent gains.

"In general precipitated bone flour alone or with 3 per cent salt is a palatable combination to self-feed to growing pigs. To older or more mature hogs (200 lbs.) a mixture of 50 per cent each of steamed and precipitated bone flour or precipitated bone flour with 37.5 per cent 'humus' may be self-fed. An alternative to feed to young pigs of 50 to 100 lbs. in weight is precipitated bone flour with 10 per cent each of 'humus' and molasses."

**Stallion enrollment.—VIII, Report of stallion enrollment work for the year 1918 with lists of stallions and jacks enrolled,** H. E. McCartney (*Indiana Sta. Circ. 86 (1919), pp. 104*).—This report of the Stallion Enrollment Board consists mainly of a directory of enrollments and renewals for the

calendar year of 1918, classified by counties. As in previous reports (E. S. R., 39, p. 73) a statistical summary is included. During the year there were enrolled 2,231 pure-bred stallions, a decrease of 325 from the 1917 totals; 1,182 grade and scrub stallions, a decrease of 496; 775 pure-bred jacks, an increase of 34; and 409 grade and scrub jacks, a decrease of 70.

**Internal factors influencing egg production in the Rhode Island Red breed of domestic fowl**, H. D. GOODALE (*Amer. Nat., 52 (1918), Nos. 614–615, pp. 65–94; 616–617, pp. 209–232; 618–619, pp. 301–321, figs. 40*).—This paper from the Massachusetts Experiment Station is described as a survey of the problem of egg production and a preliminary analysis of an egg record into its constituent elements. It is pointed out that the number of eggs laid in unit time is not an adequate measure of a hen's production, is an unsafe basis for breeding operations, and can not be used satisfactorily to study the effect of selection, because it is a complex character dependent upon the interplay of such internal factors as age at which the laying starts, rhythm and persistence of production, tendency to broodiness, occurrence of seasonal egg cycles, etc., each of which must be studied separately with respect to its influence on the numerical record and as to its mode of inheritance. The illustrative data are selected from the records of the Rhode Island Red pullets hatched at the station in 1913 and 1915.

Comparing his Rhode Island Red flock with the Maine Station Barred Plymouth Rock pullets studied by Pearl (E. S. R., 28, p. 576), the author finds that in the former individual pullets show great variations in the age at which they begin laying but that when once started they lay at a fairly uniform rate throughout the winter, whereas in the Plymouth Rocks laying begins at about the same age but continues at widely varying rates. For Rhode Island Red pullets hatched in March and April, 1913, the average age at first egg was 261.2 days, with a standard deviation of 24.3 days. For pullets hatched in March, April, and May, 1915, the mean age was 263.2 days and the standard deviation 37.7 days.

The measure of an individual's rate of production is taken as the percentage of days on which an egg was secured between the date laying began and March 1. The rate of the 1913 flock averaged 62.5, with a standard deviation of 15.8 per cent. For the 1915 flock, the average rate was 54.6 and the standard deviation 18.5 per cent. For the 1915 flock, the average rate was 54.6 and the standard deviation 18.5. The precise figures for the Maine flock with respect to age at first egg and rate of production are not available, but the author has confirmed his interpretation of published statements by personal conference with Pearl. The differences between the two flocks make it impossible to classify the Rhode Island Red genetically into mediocre and high producers by the size of the winter egg record as was done satisfactorily in the case of the Plymouth Rocks.

Suggestions as to the influence of growth, maturity, stamina, and molt on the egg record are given. Seasonal cycles seem to be of no practical importance in Rhode Island Reds for, as the author has indicated (E. S. R., 38, p. 876), the distinction between winter and spring production in this breed is arbitrary. The number of broody periods and the age incidence of broodiness are found to be highly important, but a complete discussion of these is reserved for a future publication of which a preliminary note has been issued (E. S. R., 37, p. 869).

**Commercial preservation of eggs by cold storage**, M. K. JENKINS (*U. S. Dept. Agr. Bul. 775 (1919), pp. 35, pls. 6, figs. 8*).—This contribution from the Bureau of Chemistry is based upon the systematic examination of 841 30-doz. cases of eggs of varying grades (April, May, June, and July firsts, June and

July seconds, and dirty eggs of April to July) shipped from the Middle West to New York and Philadelphia, and held for various periods at 30 to 33° F. in rooms used commercially for the cold storage of eggs in the shell. The purpose was to investigate the conditions influencing the efficiency of the cold-storage method of preserving eggs.

The commercial selection by inspection and clicking of clean eggs with sound shells from current receipts was found to be inefficient. Commercial packages of spring firsts when ready to be taken to the storage rooms showed an average of 17.5 cracked eggs and one leaking egg to the case. Candling was much more accurate since the eggs could be graded according to quality, and cracked and bad eggs could generally be detected. Cases of spring firsts graded by candling did not average more than 3 cracked eggs per case when ready for storage. Spring eggs prepared for storage by commercial sorting showed, after 7 to 11 months' storage, an average total loss of 18.5 bad eggs per case, 9 of which were due to direct spoilage of damaged eggs or to their contamination of neighboring eggs by molding. Corresponding cases of eggs graded for storage by candling showed, after a similar period of storage, 7 bad eggs per case.

The rate of evaporation of moisture from eggs was very uniform during the storage period, and averaged from 3 to 4 oz. per case per month in the different storage rooms under observation. The moisture is condensed on the brine pipes, and absorbed by the air, case, and fillers, most of the absorption of moisture by the egg package occurring during the first few months in storage. The gain in weight of individual cases with the accompanying cushions, fillers, and flats varied from 11.5 to 14 oz. during an average storage period of 10.8 months.

Eggs that were fresh when stored showed after storing an increased air space and often a tinge of yellow in the white. The yolk membrane was slightly weakened, but commercial separation into white and yolk was readily accomplished even after 11 months' storage. The percentage of ammoniacal nitrogen in eggs increased during storage, the rise being more rapid during the early part of the storage period. The amount of ammoniacal nitrogen in eggs is considered a good index of chemical deterioration.

Evidence is produced to show that the "cold-storage taste," which usually develops after 7 or more months' storage, is due mainly to absorption of odor of the strawboard fillers in which the eggs are packed.

"Imperfections in commercial handling, grading, and marketing previous to storage are mainly responsible for the bad eggs developing in commercial eggs during storage. The preservation in the shell of undergrade eggs, such as dirty, cracked, leaking, heated, and stale eggs, should not be attempted. If not marketed for prompt consumption, the contents should be removed under proper conditions and frozen. The frozen product will keep for a year or more, whereas there would be a marked deterioration in quality if the eggs were stored in the shell."

**How to caponize**, R. H. WAITE (*Maryland Sta. Bul. 226 (1919), pp. 185–192, figs. 22*).—Complete directions are given for caponizing, carefully illustrated with photographs.

## DAIRY FARMING—DAIRYING.

**Feed consumed in milk production**, H. A. HOPPER, H. M. BOWEN, and F. S. BARLOW (*New York Cornell Sta. Bul. 398 (1918), pp. 3–15*).—The 847 cows enrolled in three New York cow test associations (Otsego and Wyoming Counties) in 1914 and 1915 for which complete records were secured are classified as to

milk yield and the average feed records (excluding pasturage) of each production group in each association published. The "total" digestible nutrients (sum of digestible protein, digestible carbohydrate, and 2.25 times the digestible fats) in a feed is used as the chief basis of comparison. The average data of Henry and Morrison are employed for the standard feeding stuffs, while for proprietary feeds whose formulas were not known the published analyses of the New York State Experiment Station were utilized, coefficients of digestibility being selected "to correspond to the ingredient found to be present in largest proportion." The combined results for all three associations are tabulated below:

*Annual feed consumption of cows grouped according to milk production.*

| Range in milk production of group. | Cows in group. | Milk production per cow. | Butter fat per cow. | Feed consumed per cow. | | | Ratio, grain to milk. | Digestible nutrients consumed. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Grain. | Succulent roughage. | Dry roughage. | | Per cow. | Per 100 pounds milk. | Per pound of butter fat. |
| | | *Lbs.* | *Lbs.* | *Cwt.* | *Cwt.* | *Cwt.* | | *Cwt.* | *Lbs.* | *Lbs.* |
| Less than 5,000 pounds | 335 | 3,926 | 171.9 | 9.5 | 38.7 | 23.7 | 1:4.1 | 23.0 | 59 | 13.4 |
| 5,001 to 7,000 pounds | 368 | 5,983 | 246.0 | 13.7 | 47.0 | 22.6 | 1:4.4 | 28.2 | 47 | 11.5 |
| 7,001 to 9,000 pounds | 112 | 7,708 | 287.9 | 16.7 | 58.7 | 22.7 | 1:4.6 | 32.9 | 43 | 11.4 |
| 9,001 pounds and over | 32 | 9,967 | 345.7 | 22.9 | 74.2 | 26.1 | 1:4.3 | 39.9 | 40 | 11.5 |

Attention is called to the uniform amounts of dry roughage consumed and to the increases in grain and silage consumption with increased yield. The uniformity in the ratio of grain fed to milk produced is held to show a tendency to apportion grain without regard to the relative efficiency of individual cows.

A comparison is instituted between the records of these cows and those of a herd at the University of Wisconsin (E. S. R., 20, p. 674). A separate summary is also given of the feeding records of 93 of the cows that were listed as being two years old. Four cows selected at random are compared to show individual differences in economy of production.

**Soiling crops for milk production**, L. S. Gillette, A. C. McCandlish, and H. H. Kildee (*Iowa Sta. Bul. 187 (1919), pp. 29–59*).—This is a general discussion of soiling crops based upon the experience of the Iowa Station. The topics treated include advantages and disadvantages of the soiling system, silage *v.* soiling, production and feeding of soiling crops, crops suitable for soiling purposes, and outlines of suitable systems. "The average of seven years' work at this station indicates that 42 cows may be kept during the summer months on 20 acres of pasture and 12 acres of soiling." A bibliography of 35 titles is included.

**The possibility of increasing milk and butter-fat production by the administration of drugs**, A. C. McCandlish (*Jour. Dairy Sci., 1 (1918), No. 6, pp. 475–486*).—A preliminary test with a single cow showed an average decrease in milk flow of 3.5 lbs. per day following the administration of a bolus containing aloes, calomel, and nux vomica, a decrease of 2.1 lbs. following injections with pituitrin, a lesser decrease following alcohol feeding, and practically no change accompanying combined injections of pilocarpin and physostigmin (eserin).

A more extensive series of experiments using the same cow and two others was then carried out. Each experimental period lasted two days and was preceded and followed by check periods of four or five days. The following

is a list of substances whose galactopoietic porperties were tested, together with the daily dosage: (1) Ethyl alcohol, 4 oz. in water twice daily, (2) castor oil, 16 oz. in the evening and 8 oz. in the morning, (3) pituitary extract injected subcutaneously, 1 dram in the evening, 1 in the morning, and 2 at noon, (4) pilocarpin hydrochlorid 2 grains and physostigmin benzoate 0.5 grain hypodermically thrice daily, (5) aloes, 1 oz. in water in the evening for two cows, 6 drams in the evening in the case of the third cow, and (6) magnesium sulphate 8 ozs. and nux vomica 1.5 drams in the evening. Treatments were apparently begun after the evening milking, with the milk records of the experimental periods starting the next morning. The average records of the three cows show no increased milk yields following any of the treatments, and except for treatment (6) no decrease greater than 0.2 lb. per day. Some modifications of the fat percentages were noted, but none resulted in significant changes in amount of the fat except perhaps the reduction following pituitrin extract of 0.21, 0.16, and 0.1 lb., respectively, in the daily butter-fat yields of the three animals.

These experiments were made at the Iowa Experiment Station.

**Influence of environment and breeding in increasing dairy production, II,** A. C. McCandlish, L. S. Gillette, and H. H. Kildee (*Iowa Sta. Bul. 188 (1919), pp. 61–88, figs. 27*).—This is a second edition of Bulletin 165 (E. S. R., 35, p. 570), revised to cover all lactation records completed by August 3, 1918, including some records of second generation grades. It thus summarizes the first 11 years of an experiment in the systematic grading up of unimproved dairy stock under conditions where precise records could be kept. Essentially all the data in the earlier publication are given except the results of digestion trials. In the tabular material in the body of the bulletin the milk and the fat records are now corrected for age so as to permit a more precise comparison of daughters and dams. The corrections are based on the conclusion, drawn from a study of the records of 10,000 cows, that on an average a heifer as a yearling is capable of producing 70 per cent, as a 2-year-old 80 per cent, as a 3-year-old 85 per cent, and as a 4-year-old 95 per cent of her mature yield of milk and butter fat. In an appendix the uncorrected figures for each lactation are published.

The 7 cows brought from Arkansas as mature animals have completed 30 lactations, the 7 of Arkansas stock developed in Iowa 28 lactations, 4 half-blood Holsteins 17 lactations, 3 half-blood Jerseys 7 lactations, 6 half-blood Guernseys 16 lactations, and 5 second generation heifers 6 lactations.

The change in methods of treating the data necessitated no modifications in the conclusions to be drawn from them. The second generation grades averaged better than their dams and grand-dams in yield, persistency, and economy of production. It is noted that the daughters of one of the pure-bred Guernsey bulls showed no substantial increase over their dams' records, while heifers sired by another Guernsey bull showed a 35 per cent increase. Among the first generation grades were two full sisters; one averaged 37 per cent more and the other 23 per cent less butter fat than the dam.

**Dairying in northwestern Arkansas,** N. Radder (*Hoard's Dairyman, 57 (1919), No. 23, pp. 1139, 1160, figs. 3*).—This is an account of improvement in dairying in the Ozark region since the northwestern counties of Arkansas became tick-free in September, 1917. A large number of dairy cows have been purchased in Wisconsin and other northern states. In one county where the banks could not extend the necessary credit to the farmers under the Federal Reserve Act owing to the short-time provision, the county agent arranged with Wisconsin farmers to furnish 250 cattle on three years' credit. It is stated that a large number of silos are being constructed.

**Marketing problems of the milk producer**, L. M. DAVIS (*Milk Dealer, 7 (1918), No. 11, pp. 10–15*).—This is a general discussion which includes a statement concerning the daily news service on dairy products inaugurated by the Bureau of Markets of the U. S. Department of Agriculture and an outline of the different types of producers' organizations.

**Field surveys and dairy marketing investigations**, L. M. DAVIS (*Jour. Dairy Sci., 1 (1918), No. 6, pp. 517–526*).—This paper was presented at the Dairy Marketing Conference at Columbus, Ohio, on October 23, 1917, and gives an outline of the plans of the Bureau of Markets of the U. S. Department of Agriculture in the field of dairy marketing studies. The terminological distinction, adopted for convenience, between a "survey" of production and an "investigation" of distribution is noted.

**Dairy marketing survey in Colorado**, J. A. RAITT (*Colo. Agr. Col. Ext. Serv. Bul., 1. ser., No. 151–A (1919), pp. 54, figs. 17*).—This survey is the result of cooperation between the office of the State Dairy Commissioner of Colorado and the Bureau of Markets of the U. S. Department of Agriculture, and presents a considerable amount of statistical material, much of it in graphical form, drawn from census reports, Department of Agriculture estimates, reports of the State Dairy Commissioner, etc. The natural conditions limiting dairy farming in Colorado are pointed out. The number of dairy cows has not increased as rapidly as the population.

Creamery butter is the most important dairy product, with farm butter next. Over 300 cream-receiving stations are operated, mostly in the dry farming areas. There are frequently two or more in the same town, each with too small a volume of business to give the best price to producers. In 1917 the direct shipper received a net return of about 2.5 cts. more per pound for butter fat than the producer selling at a cream station. Some advantageously situated local creameries were able to pay 4.8 cts. above the average price received at cream stations.

Comparatively few sections of the State are able to supply sufficient whole milk to make cheese factories or milk condenseries profitable. In 1917 there were 13 of the former and 4 of the latter in operation.

Report is also made on the supply and distribution of market milk in Denver, Pueblo, and other cities.

**A survey of the dairy marketing conditions and methods in New Hampshire**, L. M. DAVIS (*N. H. Col. Ext. Bul. 8 (1917), pp. 45, figs. 8*).—This survey of the production of market milk and butter in New Hampshire was conducted by the Bureau of Markets of the U. S. Department of Agriculture in collaboration with the extension service of the New Hampshire College, and deals mostly with the steady decline which has characterized the State's dairy industry for a long period of time. The number of dairy cows decreased 20.6 per cent between 1900 and 1916, while census reports indicate a still greater decrease in production. The creamery business has also been set back, the active creameries in 1917 totaling about half the number in operation in 1888.

Aside from the usual conditions making dairying unprofitable, high feed cost, scarcity of labor, and low milk prices, certain conditions of more local application were noted, including (1) extent of the summer boarder trade, which encouraged summer rather than winter dairying and resulted in little attention to herd improvement, and, coincidentally, (2) the widespread use of bulls of the beef breeds so as to secure the most profit from veal; (3) the more recent development of city markets for whole milk, which has made rearing of dairy stock less easy and decreased the volume of business of the creameries; (4) the transportation monopoly afforded by the leased-car system, which made almost

prohibitive the direct shipment of milk and sweet cream to city consumers by organizations of producers operating their own plants; and (5) the lack of uniform schedules of milk prices. The leased-car system was abolished October 1, 1916, by order of the Interstate Commerce Commission.

Among the measures advocated for improving the industry are greater cooperation among the farmers and the making of definite contracts with distributors for milk in amounts needed for city trade, the surplus being kept on the farm and made into dairy butter and cheese, both of which are readily marketable.

**Country milk stations, functions, organization, operation, construction, and equipment,** W. A. STOCKING, W. E. AYRES, R. C. POTTS, and H. F. MEYER (*N. Y. State Col. Agr., Cornell Ext. Bul. 30 (1918), pp. 32, pls. 9, fig. 1*).—This publication, prepared in collaboration with the Bureau of Markets of the U. S. Department of Agriculture, gives suggestions as to the organization of cooperative milk stations, with a form of preliminary agreement among the organizers, sample by-laws and lease; general directions for construction and equipment; and floor plans and equipment tables for the following types of plants: (1) Cooling and canning station, (2) cream shipping station with equipment for making cottage cheese, (3) milk station with pasteurizer and churn, (4) gravity system plant for cream shipping or butter making (2 plans), (5) milk pasteurizing and bottling plant with equipment for butter and cheese making on the upper floor, (6) whole milk Cheddar cheese factory, and (7) butter and cheese factory.

**[Reports of the] committee on the production and distribution of milk,** W. ASTOR ET AL. ([*Bd. Agr. and Fisheries, London*], *Interim Rpt. Committee Prod. and Distrib. Milk, 1 (1917), pp. 6, pl. 1; 2 (1917), pp. 8; 3 (1918), pp. 30*).—These three reports constitute a synopsis of the war-time problems of the dairy industry in Great Britain and the emergency measures deemed necessary. Among the topics discussed are the distribution of labor and feeding stuffs to dairy herds, reduction of waste in transportation and storage, disposal of surplus summer milk, encouragement of winter dairying, milk reserves for infant feeding, pasteurization, the proper relation between prices of retail milk and prices of other products, new feeding methods, calf rearing, and establishment of country milk depots. At the end of the first report are charts showing the changes in the retail price of dairy products and of feeding stuffs from January, 1915, to April, 1917. There is a series of appendixes to the third report giving subcommittee reports on (1) milch goats, recommending their use, (2) producers' prices for milk during the winter 1918–19, (3) the commercial practice of pasteurization in England with the results of special bacteriological studies, and (4) soiling crops for dairy cows.

## VETERINARY MEDICINE.

**Practical bacteriology, blood work, and animal parasitology,** E. R. STITT (*Philadelphia: P. Blakiston's Son & Co., 1918, 5. ed., rev. and enl., pp. 3+XV+559+3, pl. 1, figs. 144*).—The fifth edition of this manual previously noted (E. S. R., 36, p. 574), contains new material in the sections on immunity and disinfectants and insecticides, a new chapter dealing with the medical importance of poisonous arthropods and fishes, and a table giving data as to the most important communicable diseases based upon the report of a committee of the American Public Health Association. A number of the illustrations have been replaced by new ones.

**Anaphylaxis in veterinary practice,** H. P. HOSKINS (*Vet. Alumni Quart. [Ohio State Univ.], 7 (1919), No. 1, pp. 258–264*).—This paper gives a general discussion of the phenomenon of anaphylaxis, particularly as it concerns the

veterinarian in the use of serums for the control and treatment of various infectious diseases of animals. A description is given of anaphylactic symptoms in bovines, horses, dogs, sheep, hogs, rabbits, guinea pigs, and man.

**Anaphylaxis**, RÖSSLE (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 26 (1917), No. 6, pp. 589–601*).—The phenomenon of anaphylaxis is explained as follows: The parenteral digestion of protein brings about a physico-chemical alteration of the blood with increased viscosity. This causes an irritation to the vaso-motor centers, which in turn results in an increase in the carbon dioxid in the blood resulting in carbon dioxid poisoning or anaphylactic shock.

**Isoanaphylactic poisoning caused by certain immunizing sera**, M. CARPANO (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 41 (1918), No. 10, pp. 261–274; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 11, pp. 1337, 1338*).—The author describes phenomena of special hypersensitiveness to specific immunizing sera in the following cases:

(1) A horse inoculated with a culture of streptococci and five days later with polyvalent antistreptococcic serum showed symptoms similar to anaphylaxis. The condition could not be considered a state of true anaphylaxis on account of the predisposing causes and the absence of the subsequent phenomenon of antianaphylaxis.

(2) In many cattle injected in the jugular vein with from 80 to 100 cc. of homologous antirinderpest serum, severe poisoning often followed by sudden death occurred. This could not be attributed to the phenol contained in the serum, the action of suspended albumin, or air bubbles. This phenomenon was not observed in subcutaneous inoculations.

(3) In horses suffering from African horse sickness the injection of a homologous serum into the jugular vein has often produced powerful hemolysis.

The author discusses various hypotheses which have been advanced to explain the origin of this phenomenon, to which he gives the name anaphylactoid poisoning. He states in conclusion that, since in some infections a certain number of predisposed subjects show a particular hypersensitiveness to intravenous injections of immunizing sera, such serotherapy in spite of its efficacy is not free from disadvantages and dangers.

**Studies in ananaphylaxis (antianaphylaxis)**, O. THOMSEN (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 26 (1917), No. 3, pp. 213–257, figs. 3*).—An extensive study is reported of the phenomenon of anti- or ananaphylaxis as observed in guinea pigs sensitized with horse serum injected subcutaneously and subsequently reinjected with the serum intravenously.

It was found that animals sensitized on the same day and with the same dose behaved similarly in respect to sensitization. Through calculation of the minimal lethal dose of such groups of animals the degree of anaphylaxis could be determined quantitatively. Sensitizing doses of 0.004 cc. acted more quickly than doses of 0.1 cc. The degree of sensitization was not influenced by the size of the dose, but rose quickly to a maximum and then decreased very gradually. Very young animals produced stronger antibodies than animals a few months old.

Ananaphylaxis is considered by the author to be due to three causes of the following relative importance: (1) Consumption or destruction of the anaphylactic antibody following the desensitizing antigen injection. This destruction manifests itself clinically quite differently, depending upon the strength of the existing sensitization as well as the strength of the desensitizing dose. (2) Prevention of the reaction between antigen and antibody. This is illustrated by the action of peptones, narcotics, etc., which act through lowering the reaction velocity between antigen and antibody. This influence has been shown

to be greater in weakly sensitized than in strongly sensitized animals. (3) A lowered sensitiveness to the anaphylactic poison. This is considered the least important factor.

Selection hypothesis.—**Attempt at a uniform explanation of immunity, tissue immunity, and immunity phenomena,** L. von Liebermann (*Biochem. Ztschr., 91 (1918), No. 1–2, pp. 46–85; abs. in Internat. Centbl. Gesam. Tuberkulose Forsch., 12 (1918), No. 7, pp. 186, 187*).—The author discusses the various phenomena of immunity according to the following hypothesis:

In the struggle between virus and cells, the weaker cells perish and the stronger maintain themselves and by means of increased resistance establish a relative immunity. As proof, the increase in virulence of pathogenic organisms in repeated animal passage is cited. The degree of immunity will, therefore, depend upon the proportion of slightly resistant and very resistant tissue cells, and must be higher after severe illnesses, such as typhus, cholera, and smallpox, in which more nonresistant cells are destroyed than after protective inoculation in which only a few such cells are destroyed. The destroyed tissue cells, which include cell protoplasm and the products of reaction between it and the virus, are absorbed by the blood. In this colloidal solution the antibodies can exert a similar influence on the virus as during the struggle in the tissues. The antibodies must be specific for each antigen.

Anaphylaxis is a continuation of the immunization process. The antibodies are decomposed with the formation of poisonous substances which are set free on the reinjection of antigens of strong affinity. Allergy is produced when a rather weak virus attacks the cells only superficially without destroying them, but results in an irritation which manifests itself principally on a reinjection. In cutaneous reactions, local hyperemia originates through the liberation of poisonous decomposition products of the antigen injected first.

In conclusion several references to the literature on the subject are given, with explanatory remarks as to the theories involved in the citations.

**Anti-infectious immunity: Presence of specific substances in the leucocytes of immunized animals,** A. Bachmann (*Rev. Zootéc., 6 (1919), No. 66, pp. 404–417*).—The author discusses various theories which have been advanced in explanation of immunity, and describes a series of experiments which tend to show the presence of a special substance in the leucocytes of immunized animals which renders these leucocytes better fitted than others to contend with infections and consequently to produce a state of immunity.

**Destructive hyperimmunity,** A. Vernes (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 3, pp. 118, 119*).—Attention is called to a phenomenon sometimes observed in rabbits vaccinated progressively against sheep corpuscles. If too large a quantity of erythrocytes is injected into a rabbit whose blood has become strongly hemolytic, paralysis, often fatal, occurs in a few minutes. This is thought to be due to the animal's having acquired the power of destroying too rapidly the foreign blood corpuscles. The name "destructive hyperimmunity" has been given to this phenomenon, the degree of which is apparently governed by the weight of the rabbit and the dose of injected corpuscles.

**Quantitative investigation of the influence of complement upon precipitates,** H. Lampl and K. Landsteiner (*Ztschr. Immunitätsf. u. Expt. Ther., I. Orig., 26 (1917), No. 3, pp. 193–198*).—To determine whether complement is able to digest specific precipitates, such precipitates were weighed before and after treatment with active and with inactive serum. No change in weight sufficient to indicate a digestive action of the complement was observed.

**Preservation of complement,** A. D. Ronchèse (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 5, pp. 193–195*).—For preservation of complement the

author recommends the addition of an excess of pure neutral sodium fluorid to the serum. When the complement is to be used, one volume of the serum saturated with fluorid is added to five volumes of distilled water. The titration of the complement is recommended, as after five days, during which the initial complementary power remains fixed, there is said to be a gradual diminution of complementary power.

**Guinea pig serum**, J. FREUND (*Biochem. Ztschr., 86 (1918), No. 5–6, pp. 421–425*).—The physical constants and chemical composition of guinea pig serum are reported. It is pointed out that the serum differs from other sera only in a somewhat higher water and lower protein content.

**The course of bacteriolysis produced by serum and by extract of leucocytes**, A. PETTERSSON (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 26 (1917), No. 4, pp. 305–324, figs. 2*).—Observations are reported of the velocity of bacteriolysis as influenced by the organism involved and by the bacteriolytic agent (serum or leucocytic extract).

The velocity of bacteriolysis was found to be proportional to the number of the bacteria present, whether the bacteriolytic agent be serum or leucocytes. Toward the end of the bacteriolysis the velocity decreases, since then only the more resistant bacteria are present. Bacteriolysis varies with the nature of the bacteria, and, in the case of the same organism, with the nature of the bactericidal agent, as shown by the fact that the lysis of *Bacillus anthracis* takes place rapidly in dog or horse serum and very slowly in leucocytic extracts, while pneumococci are digested rapidly by a saline solution of leucocytes and slowly by ascitic bouillon.

**On the acceleration of phagocytosis in the citrated blood and citrated blood plasma**, M. OTANI (*Kitasato Arch. Expt. Med. [Tokyo], 2 (1918), No. 2, pp. 147–218*).—An extensive investigation of the influence of citrates on the phagocytosis of the blood, both in normal and in specially immunized animals, is reported from which the following results were obtained:

Phagocytosis was greater in tuberculous than in normal blood containing sodium citrate. In some cases blood of apparently normal persons showed remarkable phagocytosis and was later found to be infected with tubercle bacilli. The opsonic index in the same cases showed no difference between normal and tuberculous blood. Invigoration of phagocytosis was also observed in citrated rabbit's blood immunized with tubercle bacilli and in human dysentery blood with dysentery bacilli, but no activation of phagocytosis was observed in mixtures of normal blood with other organisms.

The author considers that the phagocytic substance found in citrated blood plasma must be investigated further before its identity can be established, but that doubtless phagocytosis in citrated plasma is also aided by the known immune substances, opsonin and tropin. The citrated blood test is thought to be a specific reaction which has an important diagnostic value.

**A lecture on the lessons of the war and on some new prospects in the field of therapeutic immunization**, A. E. WRIGHT (*Lancet [London], 1919, I, No. 13, pp. 489–501, figs. 11*).—In this lecture, delivered before the Royal Society of Medicine (England), the natural defenses of the body against infections, particularly the antitryptic power of blood and the leucocytes, are discussed and experiments described which confirm the views expressed. A method of "immuno-transfusion" for the treatment of septic wounds is described. This consists in allowing the blood from a donor to digest a given amount of the infecting microorganisms, after which the treated blood is injected into the patient.

**Specific serotherapy of wounds and pyogenic infections**, A. GUILLAUME and G. BITTNER (*Rev. Gén. Méd. Vét., 28 (1919), No. 327, pp. 113–136*).—The authors have supplemented their earlier report of the use of polyvalent serum for the treatment of wounds (E. S. R., 37, p. 477) by a new series of observations of the success of this treatment with wounds of all kinds and cases of general pyogenic infections in horses, dogs, etc. The results obtained confirm the earlier conclusions as to the value of the treatment.

**Some observations on the use of boric acid as a disinfectant**, F. W. TANNER and R. S. FUNK (*Amer. Jour. Pharm., 91 (1919), No. 4, pp. 206–210*).—The efficiency of boric acid as a disinfectant was tested by inoculating media containing different amounts of the boric acid with various organisms, incubating, and comparing the growth obtained with controls containing no boric acid. The silk-thread method was also used.

The results indicate that boric acid possesses very little if any germicidal action, and that any inhibitory power possessed by it is not constant. The authors conclude that the use of this reagent in those cases where disinfection is absolutely essential should be discontinued.

**Flavin and brilliant green, powerful antiseptics with low toxicity to the tissues: Their use in the treatment of infected wounds**, C. H. BROWNING, R. GULBRANSEN, E. L. KENNAWAY, and L. H. D. THORNTON (*Brit. Med. Jour., No. 2925 (1917), pp. 73–78*).—As the result of a study of the bactericidal power of various antiseptics in the presence of serum, flavin, a substance belonging to the acridin group, is recommended as possessing extremely powerful bactericidal and antiseptic properties which, unlike those of the other antiseptics used, are enhanced rather than diminished by admixture with serum. It is said to be less detrimental to the process of phagocytosis and less harmful to the tissues than the other antiseptics tested, and consequently can be employed in higher concentrations without damaging the tissues or interfering with the natural defensive mechanisms. Brilliant green was found to possess similar properties to a less degree.

**The antiseptic properties of acriflavin and proflavin, and brilliant green; with special reference to suitability for wound therapy**, C. H. BROWNING, R. GULBRANSEN, and L. H. D. THORNTON (*Brit. Med. Jour., No. 2950 (1917), pp. 70–75, figs. 4*).—Certain features of these antiseptics are discussed in greater detail than in the above article, and the essential differences between the action of the flavins and brilliant green are pointed out.

Both flavin and brilliant green are antiseptics which exert a slowly progressive bactericidal action. The flavin compounds (acriflavin and proflavin) are enhanced in their bactericidal action by the presence of serum, while brilliant green, in common with most other antiseptics, is reduced in its activity by serum. For this reason brilliant green should be applied by repeated irrigation and flavin by means of gauze packing.

**The testing of antiseptics in relation to their use in wound treatment**, C. H. BROWNING and R. GULBRANSEN (*Jour. Hyg. [Cambridge], 18 (1919), No. 1, pp. 33–45*).—This article deals with a number of points which have been raised relative to the action of the flavins and brilliant green on bacteria as noted above. The choice of a medium for testing antiseptics and the methods of testing antiseptic potency are discussed, and further experiments are reported on the variations in resistance of different organisms to flavins in a serum medium.

Serum is considered the most rational medium for testing antiseptic action, as serous exudate constitutes practically the diluent to which an antiseptic is exposed in wounds. Bacteriostatic action (or inhibition of bacterial activity)

is considered of greater value in an antiseptic than toxic action or rapid destruction of the bacteria.

"It is not essential that the chemical agent should by itself actually kill the organisms. Highly successful results can be obtained by a cooperation of the antiseptic and the tissues, so that the pathogenic action of the organisms is restrained. The flavins, in virtue of their low toxicity to mammalian tissues and their high bacteriostatic power, are therefore specially suited to act as local therapeutic agents. In addition, the fact that they are not neutralized by admixture with serum enables them to be applied clinically by a relatively simple method which does not necessitate frequent renewal."

**The bactericidal value of the new disinfectant "Victoria"**, F. DE GASPERI (*Arch. Sci. Med. Vet. [Turin], 16 (1918), No. 7–12, pp. 51–102*).—An investigation is reported of the antiseptic action of a new disinfectant "Victoria" on anthrax spores, *Staphylococcus pyogenes aureus*, *Bacillus paratyphosus* B, and *B. pyocyaneus*. "Victoria" is essentially a soap solution containing 9 per cent of formalin, corresponding to 3.6 per cent of formaldehyde. Three forms are on the market in Italy for personal, domestic, and veterinary use. The first two, which differ only in quality of the castor oil used for saponification, contain a small amount of alcohol and odorous essences, while the third contains in addition some phenol.

As a result of the reported tests the conclusion is drawn that these preparations, while not destroying spores completely, can be used to advantage in the prophylaxis of the majority of the common infective and contagious diseases of animals. It is recommended that the disinfectant be applied in as concentrated a solution as possible and in amounts in excess of the material to be disinfected.

**The local use of antianthrax serum in treatment of anthrax**, J. C. REGAN (*Jour. Amer. Med. Assoc., 72 (1919), No. 24, pp. 1724, 1725*).—A report is given of the successful treatment of anthrax (human) by the injection of antianthrax serum locally around the lesion. The injection of from 10 to 15 cc. of the serum was made very slowly with an antitoxin needle and syringe, the needle being introduced in three places in the tissue just outside the margin of the lesion. The serum was administered once daily till the local process was controlled. It is considered that two or three injections will usually suffice, but that the local measures must be accompanied by suitable general treatment such as intramuscular or intravenous injections of the serum. The local treatment to be successful must anticipate the onset of anthrax septicemia.

The special advantages of this method of local treatment over the customary measures of excision, cauterization, etc., are said to be the absence of excessive scar formation and of toxic and poisonous symptoms.

**Studies on the nature of the antibodies in glanders**, W. BUROW (*Arch. Wiss. u. Prakt. Tierheilk., 44 (1918), Sup., pp. 464–472*).—A brief report is given of studies with active glanders serum, from which the conclusion is drawn that the antibody or "interfering substance" in the serum is of the nature of a soluble euglobulin, insoluble in ether and alcohol and completely destroyed by heating for 20 minutes at 70° C.

**Glanders; reinfection and etiology**, SCHÜTZ (*Arch. Wiss. u. Prakt. Tierheilk., 44 (1918), No. 3–4, pp. 115–126*).—This is a theoretical discussion of the subject on the basis of observations of the differences between Russian and German horses in the susceptibility to glanders and the course taken by the disease. Special attention is given to the so-called latent form of the disease, the course of which is compared with malaria in man. The question is raised as to the possibility of immunizing horses during this latent period in a similar manner to methods now in use for acquiring immunity to malaria.

**The diffusibility of rabic virus**, P. REMLINGER (*Ann. Inst. Pasteur., 33 (1919), No. 1, pp. 28–52*).—Experiments are reported showing that rabic virus is capable of diffusing from the head of a dog or rabbit into physiological salt solution or glycerin, and subsequently into a new head, kidney, or liver immersed in the liquid. The author discusses the bearing of this phenomenon on the nature of rabic virus, and proposes the theory that filterable viruses occupy an intermediate position between the visible microorganisms and the colloids, diastases, or toxins. The lessened virulence of rabic virus on passage through a filter of very fine pores is due, acording to the theory proposed, to a change into the finer colloidal form.

**A new immunity reaction in experimental trypanosome infection; the blood platelet test**, H. RIECKENBERG (*Ztschr. Immunitätsf. u. Expt. Ther., I. Orig., 26 (1917), No. 1, pp. 53–64*).—If blood from a rat infected with experimental trypanosomiasis is mixed with citrate bouillon before coagulation, and this mixture is inoculated with trypanosomes from the original cultures, the trypanosomes in a few minutes become covered with a thick conglomeration of blood platelets so that their movement is almost entirely impeded. The reaction is said to be specific, and to be given in all cases in which an immunity to trypanosomes has been established.

**Further experiments on the influence of protein intoxication on tuberculous infection in guinea pigs**, A. K. KRAUSE and H. S. WILLIS (*Amer. Rev. Tuberculosis, 3 (1919), No. 3, pp. 153–165*).—In continuation of work previously noted (E. S. R., 35, p. 883), further studies are reported in a controlled investigation of the influence of protein hypersensitiveness and intoxication upon tuberculous infection.

The results obtained indicate that frequent injections of protein over a long period of time render an animal abnormally susceptible to tuberculous infection, but that repeated injections of protein or repeated anaphylactic shock after tuberculous infection is established do not appreciably influence the course of the infection. Intensive and frequently repeated applications of tuberculo-protein fail to produce a state of cutaneous hypersensitiveness in animals in which no tubercles are present, and have no effect on the cutaneous hypersensitiveness in animals in which tuberculous infection has been established.

**The complement fixation reaction as applied to tuberculosis**, P. A. LEWIS (*Amer. Rev. Tuberculosis, 3 (1919), No. 3, pp. 129–152; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 23, p. 1700*).—This paper reports an application of quantitative methods to the study of the reaction of complement deviation in tuberculosis.

The results confirm the observations of others that certain tuberculous individuals give strong deviation reactions while others do not, and that certain apparently normal individuals also give strong reactions. The author concludes that, while continuous applications of the reaction throughout the course of the disease may in the future develop importance, at present "the numerical relations are such as to make it unsafe to apply the complement deviation reaction to the diagnosis of tuberculosis except as a matter of the most limited confirmatory interest."

Certain inherent defects in the method of performing the test for complement deviation are said to have been remedied to a considerable extent by increasing the time of the primary incubation to four hours and by employing several quantities of either complement or antigen simultaneously. It has been found that the extractive antigens of the tubercle bacillus so far examined contain as a prominent feature of their make-up, alcohol-soluble, thermostable substances.

**The detection of tuberculous meat by means of the precipitin reaction,** L. GRANUCCI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 41 (1919), No. 15, pp. 377–383*).—The precipitin reaction was found to be of no value in testing beef for the presence of tubercular infection.

**Passive anaphylaxis for the detection of tuberculous meat,** L. GRANUCCI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 42 (1919), No. 4, pp. 115–126*).—Evidence is given indicating that muscular plasma of tuberculous cattle when injected into rabbits produces a state of hypersensitiveness by means of which passive anaphylaxis is caused on the subsequent injection of tuberculin. The reaction may be considered to be specific in that control rabbits inoculated with the plasma from the flesh of healthy animals do not show true anaphylaxis. The anaphylactic state may be conferred upon other normal rabbits but in an attenuated form.

The author is of the opinion that the anaphylaxis test will be of considerable value to meat inspectors.

**Oak-leaf poisoning of domestic animals,** C. D. MARSH, A. B. CLAWSON, and H. MARSH (*U. S. Dept. Agr. Bul. 767 (1919), pp. 36, figs. 19*).—This is a report of investigations conducted with cattle at Salina, Utah, during the summers of 1915–1918 in which the scrub oak of Utah (*Quercus gambellii*) was fed, and at Monahans, Tex., from March 20 to May 20, 1917, in which "shinnery" oak (*Q. havardi*) was fed. A preliminary account has previously been noted (E. S. R., 39, p. 386).

It was found that continuous feeding on oak leaves may produce sickness which sometimes will have a fatal termination. "The specially marked symptoms are constipation, feces containing mucus and blood, emaciation, and edema. A diet composed exclusively of oak leaves does not form a sufficiently nutritious diet to permit normal gains in weight. Oak leaves with a small quantity of other feed may provide a maintenance ration. It has been found experimentally that as small a quantity of alfalfa hay as 3 lbs. will supplement the oak for this purpose. Oak leaves may produce injurious effects at any season. Most of the cases, however, occur in the spring, because on the range at that time there is a scarcity of other forage and the young oak leaves are attractive. While cattle later in the season may eat largely of oak, more or less other forage is available and no harmful results are experienced. The 'summer-sickness' of the Utah ranges is identical with so-called oak-brush poisoning."

The investigations have shown that during the summer and fall the oak-brush ranges of Utah can be used for grazing, not only with no harm to cattle but with positive benefit. The admission of cattle to oak-brush ranges before the grass has been started, however, practically compels the cattle to eat oak, as that is the only forage available. On the shinnery ranges, as on the oak ranges in Utah, the danger to cattle is from an exclusive diet of oak. These ranges can be used without loss, provided a comparatively small quantity of other feed is available.

**Studies in abortion disease,** H. R. SEDDON (*Jour. Compar. Path. and Ther., 32 (1919), No. 1, pp. 1–34, figs. 11*).—A detailed study is reported of the reliability of the agglutination test for contagious abortion, as determined by the results of its application to a large herd of cattle in which a number of abortions had occurred previously and during the time of the investigation. As far as possible the agglutination titre of each sample of serum was determined, milk testings (by inoculation of guinea pigs) were made, and aborted fetuses, membranes, and vaginal discharges were examined. In interpreting the results of the agglutination test, the reaction was considered positive when

agglutination was obtained with any quantity of serum not exceeding 0.01 cc. The reliability of the test as based on this standard was as follows:

All but two of the animals which had shown clinical signs of the disease gave a positive reaction. The organism was found only in animals giving a positive test. With one exception, all animals experimentally infected with cultures of *Bacillus abortus* subsequently gave positive tests. In all agglutination tests made of guinea pigs which had become infected by inoculation with cow's milk and from which *B. abortus* had been cultured, a positive reaction was obtained. Conversely, guinea pigs which failed to become infected did not give a positive agglutination test.

A detailed history illustrated by charts is given of the course of abortion disease in the herd under investigation, with interpretation of results. In conclusion, the author states that in the light of recent knowledge the problem of abortion disease may be summarized as follows:

When a nonpregnant animal becomes infected, the organism gains a lodgment in the mammary gland. In an infected pregnant animal, the organism is present in both mammary gland and uterus. After abortion the uterus quickly becomes free from abortion bacilli, but infection persists in the mammary gland and provides the source of the abortion bacilli present in the uterus at a future pregnancy.

A certain percentage (10 per cent of the cases reported) become infected only in the uterus and may recover from that infection. Bulls may act as mechanical carriers of infection, or may become infected in the testes or epididymis and eliminate organisms along with the seminal fluid. Animals may give a negative agglutination test till a few weeks before abortion. These conclusions are in agreement with those of Schroeder and Cotton previously noted (E. S. R., 36, p. 881).

**Contagious abortion of cattle: A bibliography** (*Vet Rev., 3 (1919), No. 2, pp. 137–152*).—This bibliography of 225 titles covers the literature on contagious abortion of cattle since 1895, with a few references to earlier literature.

**Treatment of contagious lymphangitis in horses by pyotherapy,** Belin (*Bul. Soc. Cent. Méd. Vét., 95 (1919), No. 4, pp. 73–93*).—This is a report of observations of 114 cases of cryptococcic (epizootic) and 247 cases of bacillary (ulcerous) lymphangitis treated by pyotherapy, which strengthens the author's opinion that pyotherapy is the only rational method for the treatment of contagious lymphangitis. A new method of sterilizing the pus for the preparation of the pyovaccine is recommended, in which a solution of 1 part idoin and 4 parts potassium iodid in 1,000 cc. of distilled water is employed in place of the ether previously recommended (E. S. R., 38, p. 587).

**The poultryman's parasite problem,** W. C. Thompson (*New Jersey Stas., Hints to Poultrymen, 7 (1919), No. 8, pp. 4*).—A brief account is given of the common ectoparasites of poultry and means for their control.

## RURAL ECONOMICS.

**How these farmers succeeded,** edited by J. R. McMahon (*New York: Henry Holt & Co., 1919, pp. VIII+261, pls. 30*).—This book is a collection of articles published in a "Best Farmer" series in the *Country Gentleman*, describing 16 successful farms in the United States.

**Farm products and cost accounting,** H. J. Davenport (*Jour. Polit. Econ., 27 (1919), No. 5, pp. 354–361*).—The argument prompting this analysis is that the high price fixed for wheat becomes a contribution to the cost of the alternative products of farming and limits the supply of them. This analysis,

when applied to the price of milk in the city, is said to show the inconsistency of efforts to arbitrate the supply, price, and consumption of it. It is argued that the farmer must be remunerated for the economic costs of this alternative product, and also that a system of regulating the monopoly or of high license of the sale of milk in the city might afford relief from the point of view of the consumer.

**Farm credit in Wisconsin**, H. C. TAYLOR (*Hoard's Dairyman, 57 (1919), No. 18, pp. 906–908*).—This address before the American Farm Management Association on January 10, 1919, deals with mortgage and personal credit in Wisconsin, and compares upper Wisconsin and the southern section of the State in this respect. The former is characterized as a deficit credit area where bank credit is unsatisfactory and chattel mortgages are much in use, while it is shown that in the southern section personal and store credit and farm mortgages are general. Several types of farm credit systems and of mortgage and loan associations are described.

**Land settlement in the mother country** (*London: Bd. Agr. and Fisheries, 1918 [vols. 1], pp. 8; [2], pp. 10; rev. in Jour. Bd. Agr. [London], 25 (1919), No. 10, pp. 1152–1160*).—These booklets have been issued by the English and Scottish Boards of Agriculture with the approval of the Admiralty and War Office to explain to ex-service men and officers, respectively, the steps that have been taken to settle them on the land and to direct them in making applications for training and for holdings.

**Report of the committee appointed by the Agricultural Wages Board to inquire into the financial results of the occupation of agricultural land and the cost of living of rural workers** (*London: Agr. Wages Bd., 1919, pp. 73; rev. in Agr. Gaz. [London], 89 (1919), No. 2361, p. 305*).—This committee, appointed March 14, 1918, by the Agricultural Wages Board of Great Britain, circulated schedules among farmers asking for particulars of receipts and expenditures during five years, and of acreage and live stock in each year, but omitting a statement of valuation at the beginning and end of the year, interest on capital, remuneration to the farmer for management, or of produce consumed by the farm household The main object was to determine the actual turnover of business and the cash profit or loss. This report is based upon 119 such schedules returned, and on data supplied by farm accounts of various farmers' organizations, the Rothamsted Experiment Station, and others. It includes a summary of the regulation of prices of the farm products of 1917 and subsequently, and gives prices of farm requisites and other farming costs under various systems of management, also retail prices of commodities in 1914 and 1918 and at earlier dates.

It is indicated that farming has been substantially more remunerative during the war than in the period immediately preceding it, and that "the cost of the standard budget would have doubled if the same food had been bought in the same quantities, that owing to modifications and slight reduction in standard, actual expenditure rose 84 per cent, and that if the modifications had been maintained, but the standard of nutrition restored, the increase would have been 90 per cent." It is shown that the cost of clothing has all but doubled, the increase in the cost in the standard budget being 90 per cent.

Detailed tabulation of the data collected is included in the appendixes.

**Wages and conditions of employment in agriculture** (*Bd. Agr. and Fisheries [London], Wages and Conditions Employment Agr., 1919, vols. 1, pp. IV+202; 2, pp. IV+504*).—Volume 1 consists of a general report by G. Drage, director of investigations, of the inquiry into the economic position of agricultural labor made by a committee appointed by the Board of Agriculture and Fish-

eries. It is divided into two main parts, the first dealing with a survey of farming, supply of labor and its quality, conditions of labor, wages and earnings, cottage accommodations and rents, relations of employers and employed, gardens, allotments, small holdings, etc., with reference to England, and the second part following practically the same plan with reference to Wales. Volume 2 embodies the 51 reports of investigators drawn up by counties of England and Wales in accordance with a syllabus prepared by the Board of Agriculture. Some of the data secured by this investigation were incorporated in the report noted above.

**Report on the wages and conditions of employment in agriculture** (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 1, pp. 4–15*).—This is an abstract of volume 1 of the work noted above.

**Profit sharing in agriculture** (*Edinb. Rev., 229* (*1919*), *No. 467, pp. 1–18; abs. in Scot. Jour. Agr., 2* (*1919*), *No. 2, pp. 229–232*).—The author describes in detail a system of partnership in farming, taking into consideration the three interests entitled to a share in the dividends of the enterprises, capital, management, and labor. He urges that this plan is one which can be put into operation at once and without disturbance in systems of management prevailing, or to the habits of mind of the men whom it would concern, that it offers a working alternative to the struggle between labor and capital and the limit imposed on wages by the capacity for productivity of the land, and further that it offers opportunity for managerial ability and facilitates direction of the work of ex-service men, who may desire to settle on the land yet who run an uncertain chance of success on small holdings.

**Prevailing plans and practices among farmers' mutual fire insurance companies**, V. N. Valgren (*U. S. Dept. Agr. Bul. 786* (*1919*), *pp. 15, fig. 1*).—Data secured from questionnaires filled out and returned by 1,161 companies are summarized here. Studies based on the same data have been previously noted (E. S. R., 37, p. 594).

**Tropical agriculture: The climate, soils, cultural methods, crops, live stock, commercial importance, and opportunities of the Tropics**, E. V. Wilcox (*New York and London: D. Appleton & Co., 1916, pp. XVIII+373, pls. 24*).—Several chapters in this volume are devoted to a discussion of the subjects of tropical climate, soils, agricultural methods, importance of tropical products in commerce, economic and social conditions and opportunities in the tropics. In subsequent ones, the author describes briefly the nature, source and commercial importance of about 350 economic plants, and gives an account of the live stock and animal products industry of the tropics.

**Rural Denmark and its lessons**, H. R. Haggard (*London and New York: Longmans, Green & Co., 1917, pp. XIV+335, pl. 1*).—This is a new impression of a book previously noted (E. S. R., 25, p. 692).

**Monthly Crop Reporter** (*U. S. Dept. Agr., Mo. Crop Rptr., 5* (*1919*), *No. 5, pp. 45–52, fig. 1*).—This number reports, as usual, the estimated farm value of important products April 15 and May 1, 1919, average prices received by producers in the United States, range of prices of agricultural products at important markets, the United States crop summary for May, and crop conditions May 1, 1919, with comparisons. It also includes data showing the condition of farm animals May 1 and estimated losses during the year ended April 30, with comparisons, crop conditions in California and Florida, and final returns showing Louisiana sugar and sirup production, 1918, also similar information regarding maple sugar and sirup. It gives a honeybee report May 1, 1919, by States, with comparisons, and special articles on farm live stock changes, varieties of spring wheat, and other topics.

## AGRICULTURAL EDUCATION.

[Canadian studies in rural life for boys and girls] (*Agr. Gaz. Canada, 5 (1918), No. 7, pp. 712–721, fig. 1*).—In the public schools of Prince Edward Island home projects are being given preference to the garden at the school. In 1915 there were 156 school gardens and 2,688 home projects; in 1916, 113 school gardens and 1,604 home projects; and in 1917, 93 school gardens and 2,250 home projects. Home projects included in 1917 grain raising, vegetable growing, beans, potatoes, flowers, poultry, live stock, and chores.

The recommendations and summary of findings made in the report of the commission on vocational training for boys and girls, appointed by the New Brunswick Government in September, 1918, are given. In accordance with these the legislature of New Brunswick, at its last session, passed the Vocational Education Act, 1918, in which prevocational education is defined as meaning the education to enable the child to select its course of study and training, and vocational education as an education, the controlling purpose of which is to fit for profitable employment, and which includes industrial, agricultural, commercial, and home economics education. The Province is to aid in the maintenance of vocational and prevocational schools established under the act, on a joint basis with the local communities, the total to be expended in any one year being limited to $50,000.

Every high and consolidated school in Manitoba is now taking part in some form of boys' and girls' club work. The juniors are engaged largely in raising chickens and in gardening, while the older pupils find the most interest in the pig and calf raising contests, and in growing registered seed. The departments of agriculture and education cooperate very closely in an effort to correlate the educational and economic phases of club work.

From November to April, 1917–18, 22 short-course schools in agriculture, gas engines, and home economics, extending over two weeks each, were held in Manitoba. It was found most convenient to organize the schools in three circuits, for each of which there was obtained a carload of equipment consisting of three tractors, four stationary engines, a lighting plant, a grain cleaning outfit, about fifty 16 by 20 inch bromids of champion live stock, and a full supply of the various grains grown in Manitoba, as well as all the troublesome weeds. A staff of expert lecturers was engaged for each circuit. The forenoons were usually given over to lectures for the whole school, while the practical work was done in the afternoons when the school was split into sections. The regular women's classes in home economics were well attended, and probably 8 per cent of those taking gas engine work were women.

The department of education for Alberta has reorganized and extended the instruction work for public school inspectors at the summer school. The most important additions are the lectures on the generalized aspects of agriculture, which include farm management, rural economics, and rural sociology.

A discussion of the duplication of agricultural teaching in general secondary schools and special schools of agriculture, such as there are in Alberta, is included. It is stated that there does not appear to be any real overlapping or duplication of work from the teaching of agriculture in these two types of schools, which differ from each other in the characteristic purpose of the agricultural teaching. Since little instruction in agriculture is given in the normal schools and the agricultural courses in the summer schools are purely optional, the course in agriculture in the high schools is more explicitly designed as a course for teachers in the public schools. The best results of the special school are the making of good farmers and home makers, while the best results of the

high school are that pupils get some well presented information about agriculture, with some inside laboratory and a little plat work.

Course in agriculture for a four-year high school, F. T. Ulrich (*School Sci. and Math., 19 (1919), No. 3, pp. 214–227*).—In this study of a course in agriculture for a four-year high school, the results reported are essentially a collation of judgments of 50 leading educators of the country.

Of these, 42 favor a combination of practical instruction with the general training idea and 21 would require larger emphasis on the practical subjects than is given at present. "Evidently, the agreement is practically unanimous on the use of industrial materials for educational purposes in the high school. The difference of opinion seems to lie in the question as to the degree that this subject matter is to be used for general educational purposes, or for the development of knowledge and skill for direct participation in the industrial life of the nation."

The median of recommendations of 28 of the 50 educators for required work in English is 5.2 units (interpreting a unit to mean a subject pursued for one semester or one-half year, with one recitation daily) in a four-year agricultural course of 32 units, with mathematics 2.68 units, biological science 3.2 units, social science 3.9 units, and physical science 3 units. In addition, one correspondent suggests that 2 units of rural economics and 1½ units each of manual training, drawing, and music be required; another would require 1 unit each of drawing and music.

With reference to the apportionment of time between the general and the agricultural subjects, the median for 33 correspondents is 34.9 of the time for agricultural instruction, with a range of from 25 to 60 per cent.

"It was a surprise to discover in some of the replies a lack of appreciation of the difference between art and science of a subject." Twenty-four of the educators give a numerical valuation with a median of 52 per cent of the time for the art of agriculture and 54.8 per cent for the science. The range for the art is from 10 to 66⅔ per cent, and for the science from 33⅓ to 90 per cent.

Twenty-one of the replies showed convictions that the fundamentals of science are best learned in the standard sciences, the special features of each science that are applicable being again stressed in the agricultural courses. Five would abandon the science courses and teach the principles of science as the comprehension of the agricultural subject demands. Two subscribe to both of the options, and four maintain that the principles of science should be developed in connection with the agricultural subjects, but that in the last year of the course the principles of each science should be unified and organized, so that at the time of graduation the student may have a body of scientific generalizations.

With reference to the best laboratory for training students in the skill of agriculture, the present tendency, especially in Massachusetts, New York, Minnesota, and Wisconsin, is to push the project idea. Out of 33 of the educators, 31 are favorable to projects, and of these 27 would require them. A classification of 37 answers shows that 19 of the educators are of the opinion that students should devote a portion of school time on a farm to gain proficiency in the practical affairs in agriculture, while 5 favor this idea unless the students are farm born and trained. Three say that some time outside of school should be spent on the farm, and 2 think that project work is better.

The sequence of the agricultural courses with reference to each other, and the semester and year of the academic course, particularly the standard science courses, as well as the content of the agricultural subjects, are also discussed. It is found that "the usual order of agricultural subjects in the course is plant studies the first year, animal studies the second year, soils and fertilizers the

third year, and farm mechanics and management the fourth year. A satisfactory arrangement of the general subjects, particularly the science courses, is one of the unsolved problems if the principles of science should be taught in courses more or less separate from the agricultural courses. The content of the agricultural courses is under vigorous consideration at the present time, under the stimulation of the Smith-Hughes legislation, which is interpreted by some to mean a protest against the present materials in the agricultural subjects." The author finds that a definite formulation of a course in agriculture in harmony with the recommendations of the 50 educators and the discussions does not seem advisable.

**Lessons on potatoes for elementary rural schools**, A. DILLE (*U. S. Dept. Agr. Bul. 784 (1919), pp. 23*).—This bulletin contains outlines of twelve lessons dealing with the selection, planting, cultivation, harvesting and grading, marketing, winter storage, judging, and uses of potatoes, the structure of the potato tuber, the place of potatoes in the rotation, soils, seed treatment, and pests. Suggestions are given with reference to sources of information, illustrative material, the survey, the home project, and correlations.

**Lessons on dairying for rural schools**, A. DILLE (*U. S. Dept. Agr. Bul. 763 (1919), pp. 30, figs. 14*).—The author outlines twelve lessons in dairying, which deal, respectively, with the production, care, weighing, and testing of milk, records and marketing, profit and loss, judging and purchasing, care and handling of the dairy cow and barn, butter making, the food value of milk, cottage cheese, and the use of milk and its products in cookery. An outline for a district dairy cow survey, score cards for sanitary inspection of dairy farms and for dairy cows and butter, and suggestions with reference to sources of information, illustrative material, and the home project, are included.

**List of workers in subjects pertaining to agriculture, home economics, and marketing, 1918–19** (*U. S. Dept. Agr., List of Workers in U. S. Agr., 1918–19, pp. 73+89*).—This is the usual organization list of workers along these lines (E. S. R., 39, p. 497). Part 1 deals with the U. S. Department of Agriculture, and part 2 with the agricultural colleges and experiment stations.

## MISCELLANEOUS.

**Report on experiment stations and extension work in the United States, 1917** (*U. S. Dept. Agr., Rpt. Expt. Stas. and Ext. Work, U. S. 1917, pts. 1, pp. 335: 2, pp. 416, pl. 1*).—This report, prepared by the States Relations Service for the fiscal year ended June 30, 1917, consists of two parts.

*Part I. Work and expenditures of the agricultural experiment stations, 1917.*—This part includes the usual report on the work and expenditures of the agricultural experiment stations in the United States, including Alaska, Hawaii, Porto Rico, and Guam, together with detailed statistics compiled from official sources as to the organization, revenues, additions to equipment, and expenditures of the stations.

During the fiscal year ended June 30, 1917, the total income of the stations, including those in Alaska, Hawaii, Porto Rico, and Guam, was $5,642,149.16. Of this amount $718,744 was derived under the Hatch Act, $718,358.04 under the Adams Act, $143,000 from the Federal appropriations for the insular stations, $2,322,335.65 from State appropriations, $30,764.78 from individuals and communities, $365,552.53 from fees, $696,108.33 from the sale of products, and $644,387.87 from miscellaneous sources. The value of additions to the equipment of the stations during the year is estimated as $751,198.33, of which $318,500.59 was for buildings.

The stations employed 1,955 persons in the work of administration and inquiry. Of this number 950 were also members of the teaching staff of the col-

leges, and 691 assisted in the various lines of extension work. During the year the stations published 1,624 annual reports, bulletins, and circulars, aggregating 28,109 pages, and these were distributed to 1,130,219 addresses on the regular mailing list.

*Part II. Cooperative extension work in agricultural and home economics, 1917.*—This is the third annual report on the receipts, expenditures, and results of cooperative agricultural and home economics extension work in this country. Pages 19–162 are devoted to Extension Work in the South, pages 163–375 to Extension Work in the North and West, pages 377 and 378 to Farmers' Institutes in the United States in 1917, by J. M. Stedman, and pages 379–410 to statistics of farmers' institute and extension work.

**Annual report of the director for the fiscal year ending June 30, 1918** (*Delaware Sta. Bul. 122 (1918), pp. 31*).—This contains the organization list and the report of the director on the work and publications of the station, including a financial statement for the fiscal year ended June 30, 1918. The experimental work recorded is for the most part abstracted elsewhere in this issue.

**Thirtieth and Thirty-first Annual Reports of Georgia Station, 1917 and 1918** (*Georgia Sta. Rpts. 1917–18, pp. 24*).—This contains the organization list, reports by the president of the board of directors and the director of the station on its work during the two years, and a financial statement for the fiscal years ended June 30, 1917, and 1918. The experimental work reported is for the most part abstracted elsewhere in this issue.

**Report of Hawaii Station, 1918** (*Hawaii Sta. Rpt. 1918, pp. 55, pls. 11*).—This contains the organization list, a summary by the agronomist in charge as to the work of the year, and reports of the divisions of horticulture, chemistry, plant pathology, agronomy, and extension, and of the Glenwood substation. The experimental work recorded is for the most part abstracted elsewhere in this issue.

**Thirty-first Annual Report of Illinois Station, 1918** (*Illinois Sta. Rpt. 1918, pp. 20*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1918, brief notes as to the principal lines of work, and a list of publications of the year. Brief notes of progress in horticultural studies are abstracted on page 146 of this issue.

**Twenty-ninth Annual Report of New Mexico Station, 1918** (*New Mexico Sta. Rpt. 1918, pp. 73, figs. 9*).—This contains the organization list, a report of the director on the work and publications of the station, including reports of heads of departments, and a financial statement for the year ended June 30, 1918. The experimental features not previously reported are for the most part abstracted elsewhere in this issue.

**The work of the experiment station.—Report of director, 1917, T. P. Cooper** (*North Dakota Sta. Rpt. 1917, pp. 27, figs. 7*).—This, the twenty-eighth report of the station, contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1917. The experimental work reported is for the most part abstracted elsewhere in this issue.

**Monthly Bulletin of the Ohio Experiment Station** (*Mo. Bul. Ohio Sta., 4 (1919), No. 4, pp. 97–135, figs. 19*).—This contains several articles abstracted elsewhere in this issue, together with one entitled Growing Rape for Summer Forage, by F. A. Welton, and notes.

**Program of work of the United States Department of Agriculture for the fiscal year 1919, E. H. Bradley** (*Washington: U. S. Dept. Agr., 1919, pp. IX+617*).—The activities of this Department are set forth in project form.

# NOTES.

**Connecticut State Station.**—Major John P. Street, chief of the department of chemistry, resigned August 1 to engage in commercial work and has been succeeded by Dr. E. M. Bailey.

**Georgia Station.**—The legislature has appropriated $8,000 to supplement the Federal funds in the repair and upkeep of the station.

**Hawaii College.**—The territorial legislature has recently enacted legislation whereby in 1920 the college will be expanded into the University of Hawaii. Two colleges will be organized, a college of applied science, which will continue most of the present curriculum, including agriculture and mechanical arts, and a college of arts and sciences, to offer courses in cultural lines and leading to the B. A. degree.

**Idaho University and Station.**—Dr. Wilber R. Kidwell has been appointed assistant professor of veterinary science in the college of agriculture, beginning September 1. R. S. Snyder, assistant in soil chemistry in the Iowa Station, has been appointed assistant chemist in the station.

**Maryland Station.**—E. V. Miller has been appointed assistant plant physiologist, George F. Stuntz, assistant agronomist, and F. S. Holmes, seed inspector, succeeding S. V. Eaton, W. J. Aitcheson, and C. P. Smith, respectively. E. H. Brinkley has resigned as farm superintendent.

**Massachusetts College.**—The innovation was tried this year of holding farmers' week in midsummer instead of in the spring. The plan is reported as very successful, the maximum attendance aggregating over 1,500 and being of a very representative nature.

**Ohio Station.**—*Science* announces that Don C. Mote, assistant animal husbandman in parasitology investigations, has been appointed State entomologist of Arizona, beginning July 1.

**Oregon College and Station.**—C. I. Lewis, head of the department of horticulture and vice-director of the station, has resigned to engage in commercial work. Dr. E. J. Kraus, dean of service departments and research horticulturist, has been appointed professor of applied botany at the University of Wisconsin. F. S. Wilkins, instructor in farm crops at the Iowa College, has been appointed assistant professor of farm crops.

**Rhode Island Station.**—Chester Bridge and William Mather, 1919 graduates of Wesleyan University and the Massachusetts Agricultural College, respectively, have been appointed assistants in chemistry and have entered upon their duties.

**Vermont University.**—At the last session of the legislature an appropriation of $25,200 per annum was made for cooperative extension work. This is to be expended through the county farm bureaus, at the rate of $600 per year for each of the three main divisions, namely, county agents, home demonstrations, and boys' and girls' clubs.

**Wyoming University and Station.**—Work has been begun on a double house at the university stock farm.

Dr. J. W. Scott, professor of zoology and research parasitologist, is to spend the coming year in research work in the East, partly in Washington, D. C.

Dr. J. I. Hardy, associate wool specialist of the station, has accepted a position in connection with the sheep and wool investigations of the Bureau of Animal Industry of the U. S. Department of Agriculture.

**Ontario Agricultural College.**—A memorial hall is projected in commemoration of the former students of the college, numbering over one hundred, who lost their lives in the war. This building will contain an assembly hall seating at least 800 and will cost about $100,000. The government has appropriated $40,000 for the purpose, and it is planned to raise the remaining sum by subscription from the alumni and others interested.

**Soldier Training at Canadian Experimental Stations.**—Arrangements have been made for giving agricultural instruction to returned soldiers at the Dominion Experimental Farms at Fredericton, New Brunswick, and Lennoxville, Quebec. The object will be to qualify returned soldiers as farmers under the Soldiers' Land Settlement Act. An instruction staff and such additional equipment as is found necessary will be furnished by the Soldiers' Settlement Board. The work will be under the direction of the superintendent of the station, and will be so arranged as to interfere as little as possible with the regular experimental work under way.

**Agricultural Education for Ex-service Men in Great Britain.**—The Department of Demobilization and Resettlement of the Ministry of Labor announces that the British Government has decided to provide assistance to ex-service men, irrespective of their military rank, who desire to continue their education and training but are financially unable to do so. The types of training for which assistance may be granted include courses in both higher education in agriculture and practical training on farms, either in institutions approved by the Board of Agriculture and Fisheries of Great Britain or the corresponding boards in Scotland and Ireland.

**Sugar Beet Growing Work of British Board of Agriculture.**—An estate of 5,600 acres has been purchased by the British Sugar Beet Growers' Society with the financial assistance of the government at Kelham near Newark. It is planned to develop this estate as a test of commercial beet growing on a large scale.

**Agricultural Encouragement in France.**—An annual appropriation of $250,000 has been made to stimulate improved methods in agriculture following the war. This sum will be expended through committees representing the various departments and serving without pay. It is planned to purchase high grade cattle of from 7 to 8 years of age, which now are frequently marketed, and to resell them to farmers in order to demonstrate their value for breeding purposes. It is also planned to purchase American farm machinery for resale to demonstrate its ultimate economy in terms of service. Agricultural fairs are to be further developed and seed grain stocks purchased and distributed at nominal sums for demonstration purposes.

**Miscellaneous.**—An animal husbandry class in Aberdeen University, Scotland, was opened last April for soldier students of the Canadian, Australian, and South African expeditionary forces with an enrollment of about 100. Visits to leading herds in the vicinity were a noteworthy feature of the course.

The American Association of Agricultural College Editors held its seventh annual meeting at Columbus, Ohio, June 25 to 27. The officers elected for the ensuing year include F. H. Jeter of North Carolina, president; F. C. Dean of Ohio State University, vice-president; and M. V. Atwood of Cornell University, secretary-treasurer. The next meeting will be held at the Massachusetts Agricultural College.

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# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**Annual reports on the progress of chemistry for 1918**, edited by J. C. CAIN and A. J. GREENAWAY (*Ann. Rpts. Prog. Chem. [London], 15 (1918), pp. IX+240*).—This is the usual annual report (E. S. R., 40, p. 109). Of special interest to the agricultural chemist are notes on the progress in agricultural analysis in the report on Analytical Chemistry by C. A. Mitchell, and the report on Agricultural Chemistry and Vegetable Physiology by E. T. Russell. This report includes advances in the chemistry of soil, fertilizers, plant growth, feeding stuffs, milk, and fermentation.

**Studies relating to milk** (*New York Sta. Tech. Bul. 65 (1918), pp. 3–54, figs. 4*).—This bulletin consists of three papers which have been previously noted from other sources as follows: (1) The Preparation of Pure Casein, by L. L. Van Slyke and J. C. Baker (E. S. R., 39, p. 801); (2) a Method for Making Electrometric Titrations of Milk and Other Solutions Containing Proteins, by J. C. Baker and L. L. Van Slyke (E. S. R., 39, p. 611); and (3) Free Lactic Acid in Sour Milk, by L. L. Van Slyke and J. C. Baker (E. S. R., 39, p. 613).

**Preparation of rhamnose**, E. P. CLARK (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 255, 256*).—Satisfactory yields of rhamnose from quercitron extract are said to be obtained by the following process:

Two kg. of liquid quercitron extract is dissolved in enough hot water to make 5.5 liters. To the boiling solution is gradually added 180 cc. of concentrated sulphuric acid dissolved in 320 cc. of water. After boiling gently for 30 minutes, the mixture is poured into an enameled kettle and cooled quickly. The insoluble matter is filtered off and the remaining liquid neutralized with barium hydroxid and filtered. The filtrate is evaporated to a thin sirup, 8 volumes of 95 per cent alcohol are added slowly with constant stirring, and the precipitate formed is filtered off on a Büchner funnel. The resulting filtrate is evaporated under diminished pressure to a thick sirup, dissolved in 1 liter of 95 per cent alcohol, and treated with 2.5 liters of ether.

The gummy substance precipitated is separated from the supernatant liquid by decantation, dissolved in 50 cc. of water and enough alcohol to make 1 liter, and again precipitated with 2.5 liters of ether. The liquid is decanted and the two ethereal extracts are mixed and allowed to stand over night. The clear solution is poured from the gummy substance, the ether is recovered by distilling on a steam bath, and the remaining alcoholic solution evaporated under diminished pressure to a thick sirup. An equal volume of alcohol and some ether are added and, upon scratching the flask or seeding, the rhamnose sepa-

rates out and is removed by filtering on a Büchner funnel and washing first with a mixture of 1 part ether and 2 parts alcohol, then with a 1:1 alcohol and ether mixture, and finally with ether. The yield is said to be from 50 to 55 gm. of white sugar, which may be recrystallized from water or alcohol in the usual way.

**The composition of starch.—I, Precipitation by colloidal iron. II, Precipitation by iodin and electrolytes,** J. MELLANBY (*Biochem. Jour., 13 (1919), No. 1, pp. 28–36*).—The composition of starch has been studied by means of the effects produced by colloidal iron and by iodin on a solution of potato starch in water.

Precipitation of starch by colloidal iron showed that starch granulose can be separated into three fractions forming 80 per cent, 9 per cent, and 11 per cent, respectively, of the starch granulose. The first fraction is precipitated by colloidal iron only, the second by colloidal iron and electrolytes, and the third is not precipitated by colloidal iron under any conditions.

Precipitation of starch by iodin and electrolytes showed that starch contains an insoluble constituent which does not react with iodin (amylocellulose), that all the soluble constituents of starch are precipitated by iodin in the presence of electrolytes, and that the final fraction precipitated by iodin gives a brown color with iodin.

These results are thought to indicate that "starch contains a variety of polymers varying in complexity from amylodextrin to amylocellulose, the relative quantities of dextrin and cellulose being small while the bulk of the granule is composed of amylogranulose."

Iodin was found to unite with starch quantitatively, forming starch iodid. Approximately 1,600 gm. of starch are equivalent to 127 gm. of iodin. Starch iodid, however, absorbs iodin from solution so that after the equivalent point is reached the amount of iodin contained in the precipitated starch iodid is a function of the amount of iodin contained in the original solution.

**Nature of the cellulose of cereal straw,** E. HEUSER and A. HAUG (*Ztschr. Angew. Chem., 31 (1918), No. 39, Aufsatzteil, pp. 99, 100; No. 41, Aufsatzteil, pp. 103, 104; No. 71, Aufsatzteil, pp. 166–168; No. 73, Aufsatzteil, pp. 172–176; abs. in Chem. Abs., 12 (1918), No. 22, p. 2439; 13 (1919), No. 10, p. 1148*).—This paper reports a detailed study of the determination and properties of cellulose in cereal straw, as a result of which the conclusion is drawn that the constitution of straw cellulose apparently corresponds to that of cotton cellulose. It is strongly contaminated with a pentosan, and so modified by the usual bleaching processes that the pulp contains considerable oxycellulose.

**Studies on enzym action.—XVII, The oxidase, peroxidase, catalase, and amylase of fresh and dehydrated vegetables,** K. G. FALK, G. MCGUIRE, and E. BLOUNT (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 229–244*).—In continuation of the series of studies on enzym action previously noted (E. S. R., 38, p. 803), an investigation is reported of the enzyms oxidase, peroxidase, catalase, and amylase in extracts of fresh, air-dehydrated, and vacuum-dehydrated potatoes, tomatoes, carrots, white and yellow turnips, and cabbage at different H-ion concentrations.

The extracts of the fresh vegetables were prepared by straining through muslin the finely ground product. The dehydrated vegetables were soaked for 20 minutes in the average amount of water lost on dehydration and were then ground in the meat chopper and strained. The H-ion concentration of the juice was determined colorimetrically. The technique used in testing the enzyms is described in detail. The results obtained may be summarized as follows:

The H-ion concentrations of all the vegetable juices were in the neighborhood of pH 6 with the exception of tomato juice, which was about pH 4. However, in bringing the H-ion concentration of the juices to various values between pH 2 and 12 less acid and more alkali were required for the dehydrated products than for the fresh vegetables for the same concentration. This difference was more marked with air-dehydrated than with vacuum-dehydrated products. This is thought to indicate definite changes brought about in dehydration, probably in the character of the protein material.

The enzym reactions of all the vegetable juices studied were destroyed by boiling for several minutes. The oxidase reaction with carrot, yellow and white turnip, and potato juices was greatly increased on dilution. No well defined H-ion concentration for maximum action with oxidase, peroxidase, and catalase was observed although the actions were better in the more alkaline solutions between pH 7 and 10. They were inhibited in acid solution, pH 2 and 3 for oxidase and peroxidase and pH 4 for catalase, except in the case of the tomato. With the exception of cabbage and carrot, the enzym action was less in the juice from the dehydrated than from the fresh vegetables, and less in the air-dehydrated than in the vacuum-dehydrated products.

The optimum amylase action in cabbage, carrot, and white turnip juices was at about pH 6, and in yellow turnip juices at from pH 4 to 7. The optimum H-ion concentration for the vegetable juice amylases coincided with the natural H-ion concentrations of these juices.

In considering the enzym results, the authors point out that the state of ripeness and the age of the vegetable undoubtedly influence the activities. In regard to dehydration, the shorter the period of time in which heat is applied the smaller will be the changes in enzym action, which probably accounts partly at least for the smaller changes in the vacuum dehydration products. It is suggested that the dark color of unboiled air-dehydrated potatoes may be avoided by increasing the H-ion concentration of $10^{-6}$ or $10^{-7}$ N to $10^{-5}$ N before dehydration, thus equalizing the H-ion concentration of the potato and ordinary water. This may be accomplished by treating the potatoes with dilute acid solution before dehydration.

**Oxidizing enzyms.—I, The nature of the "peroxid" naturally associated with certain direct oxidizing systems in plants,** M. W. Onslow (*Biochem. Jour., 13 (1919), No. 1, pp. 1–9*).—Evidence is presented to show that in plants in general which brown on injury the peroxidase is associated with an aromatic substance giving the reaction characteristic of the catechol grouping. In such plants the peroxidase on injury activates the oxidation of the aromatic substances, giving rise to peroxids, and the system peroxid-peroxidase will then blue guaiacum. Plants which do not brown on injury do not contain a substance with the catechol grouping, and their enzyms do not catalyse the oxidation of substances with such a grouping.

**Observations on the accuracy of different methods of measuring small volumes of fluid,** F. W. Andrewes (*Biochem. Jour., 13 (1919), No. 1, pp. 37–44*).—The author reports a comparison of the accuracy of the pipette and drop methods of measuring sera, particularly in the preparation of a series of doubling dilutions.

The chief conclusions from the observations made are (1) that volumes of 1 cc. and 0.5 cc. can be measured by pipette with reasonable accuracy, but that the error resulting from the attempt to deliver 0.1 cc. may amount to 5 per cent even when a 0.1 cc. pipette is employed; (2) that the only way in which accurate results can be obtained with a pipette in preparing an ascending series of dilutions is to use it as a delivery pipette and wash and dry it between

successive measurements; and (3) that the drop method, if properly carried out with calibrated pipettes, is greatly to be preferred for serological work.

**Contribution to the study of the replacement of platinum by an alloy in apparatus for electrolytic analysis**, P. NICOLARDOT and J. BOUDET (*Bul. Soc. Chim. France, 4. ser., 25 (1919), No. 2, pp. 84–86*).—As a result of further investigation of the practicability of using an alloy in place of platinum for electroytic apparatus (E. S. R., 40, p. 109), the authors state that an alloy of gold and copper 9:1, treated for two hours with hot nitric acid and washed and dried, has proved entirely satisfactory for the cathode in long continued practical application. The anode of the same alloy is made in cylindrical form and protected by a thin layer of electrolytically deposited platinum.

**Table of pH, H+ and OH— values corresponding to electromotive forces determined in hydrogen electrode measurements, with a bibliography**, C. L. A. SCHMIDT and D. R. HOAGLAND (*Univ. Cal. Pubs. Physiol., 5 (1919), No, 4, pp. 23–69*).—The authors have prepared tables for the conversion of voltage into hydrogen and hydroxyl-ion concentrations for both the normal and N/10 KCl calomel electrode. The pH values according to the Sörenson notation have also been included. The measurements and equations upon which the calculations are based are described in detail.

The publication also contains a bibliography of 467 references to the literature on hydrogen-ion concentration classified under the headings of general and theoretical, biological (including blood, urine, milk, miscellaneous body fluids and tissues, proteins, enzyms, and sea water), bacteriological, soil and plant, miscellaneous, and indicators.

**A compilation of methods for the quantitative determination of nitrites and nitrates in the presence of each other**, A. OELSNER (*Ztschr. Angew. Chem., 31 (1918), No. 73, Aufsatzteil, pp. 170–172; No. 75, Aufsatzteil, pp. 178, 179; abs. in Chem. Abs., 13 (1919), No. 4, pp. 295, 296*).—The author points out the importance in the investigation of nitrification and denitrification processes of determining the content of nitrites and nitrates in the culture solution, and discusses the following methods for such a determination: Colorimetric methods, gasvolumetric methods, a modified volumetric method devised by the author, the precipitation method, and the ester method.

The author's method, which is described in detail, consists essentially in estimating the nitrite by titration with potassium permanganate in acid solution and the nitrate by reduction with zinc and iron in alkaline solution. Because of the volatility of the nitrous acid, the titration is made by running the solution of nitrite from a burette into a measured quantity of the acid permanganate solution diluted with water and heated at 40°. The last drops are added slowly, and after decolorization the solution is titrated back with the permanganate solution. For the nitrate determination it is necessary to use an amount of the sample furnishing from 10 to 30 mg. of nitrate nitrogen.

The method is considered to be well adapted for following quantitatively the nitrification processes, provided ferrous sulphate is absent from the sample. If citric acid is present, the nitrite should be added very slowly and the back titration omitted.

**Observations on the albuminoid ammonia test**, E. A. COOPER and J. A. HEWARD (*Biochem. Jour., 13 (1919), No. 1, pp. 25–27*).—Abnormal results in albuminoid ammonia determinations led to the discovery that potassium permanganate may contain a stable nitrogenous impurity, which can not as a rule be removed by prolonged boiling with alkali but which gradually decomposes when the solution is considerably diluted. The authors emphasize the necessity in

routine work of testing fresh supplies of chemicals for the impurity, and in very accurate work of conducting a control experiment during each determination of albuminoid ammonia.

**The gravimetric determination of sulphate as barium sulphate,** I. M. KOLTHOFF and E. H. VOGELENZANG (*Pharm. Weekbl., 56 (1919), No. 5, pp. 122–142; abs. in Chem. Abs., 13 (1919), No. 9, p. 944*).—The various sources of error in the determination of sulphate as barium sulphate are discussed from the literature on the subject and from experiments conducted by the authors. The following conclusions are drawn:

The solubility of barium sulphate (2.3 mg. per liter at room temperature) is greatly increased by higher temperature. The presence of nitric or hydrochloric acid also increases the solubility of barium sulphate. This is more marked with nitric than with hydrochloric acid. Dry ignition in porcelain or moist ignition in platinum causes little or no reduction, dry ignition in platinum considerable reduction. The precipitate should be moistened with sulphuric acid and ignited to constant weight. Occluded salts can not be washed out after ignition as the occlusion is chemical in nature. The error due to phosphates is caused by the formation of barium phosphate from the barium sulphate. It is impossible to prescribe a general method of procedure for the accurate determination of sulphates in any particular solution.

**The determination of sulphate as strontium sulphate,** I. M. KOLTHOFF and E. H. VOGELENZANG (*Pharm. Weekbl., 56 (1919), No. 6, pp. 159–161; abs. in Chem. Abs., 13 (1919), No. 9, pp. 944, 945*).—The determination of sulphate as strontium sulphate is shown to be subject to the same errors as in the case of barium sulphate noted above. While alcohol decreases the solubility of strontium sulphate alone, free acids and certain salts act as disturbing factors. A table is given showing this influence.

**The statement of acidity and alkalinity with special reference to soils,** E. T. WHERRY (*Jour. Wash. Acad. Sci., 9 (1919), No. 11, pp. 305–309*).—The author proposes a method of stating acid and alkaline reactions in terms of so-called "specific acidity" and "specific alkalinity" the unit of which, instead of being 1 gram-equivalent per liter as in the usual method, is the number of gram-equivalents per liter of each ion present in pure water at ordinary temperature. The table given below, an abbreviation of the one given in the original article, shows the actual numbers corresponding to the powers of 10 representing some of the reactions likely to be met with in soil. The new values are called chemical potentials, and at the suggestion of E. Q. Adams are given the letter X, the Greek initial of chemical.

*Comparison of different methods of stating reactions.*

| General reaction. | Usual methods. | | | | Proposed methods. | | | | Proposed descriptive terms. |
|---|---|---|---|---|---|---|---|---|---|
| | $H^+$. | $OH^-$. | pH. | pOH. | Specific acidity. | Specific alkalinity. | $X_H$. | $X_{OH}$. | |
| Acid | $10^{-0}$ | $10^{-14}$ | 0 | 14 | $10^{7}$ | $10^{-7}$ | 7 | −7 | |
| | $10^{-3}$ | $10^{-11}$ | 3 | 11 | $10^{4}$ | $10^{-4}$ | 4 | −4 | Superacid. |
| | $10^{-4}$ | $10^{-10}$ | 4 | 10 | $10^{3}$ | $10^{-3}$ | 3 | −3 | Mediacid. |
| | $10^{-5}$ | $10^{-9}$ | 5 | 9 | $10^{2}$ | $10^{-2}$ | 2 | −2 | Subacid. |
| | $10^{-6}$ | $10^{-8}$ | 6 | 8 | 10 | $10^{-1}$ | 1 | −1 | Minimacid. |
| Neutral | $10^{-7}$ | $10^{-7}$ | 7 | 7 | $10^{0}$ | $10^{0}$ | 0 | 0 | Mininalkaline. |
| Alkaline | $10^{-8}$ | $10^{-6}$ | 8 | 6 | $10^{-1}$ | $10^{1}$ | −1 | 1 | Subalkaline. |
| | $10^{-9}$ | $10^{-5}$ | 9 | 5 | $10^{-2}$ | $10^{2}$ | −2 | 2 | Medialkaline. |
| | $10^{-10}$ | $10^{-4}$ | 10 | 4 | $10^{-3}$ | $10^{3}$ | −3 | 3 | Superalkaline. |
| | $10^{-11}$ | $10^{-3}$ | 11 | 3 | $10^{-4}$ | $10^{4}$ | −4 | 4 | |

In the study of soils associated with various plants, the author has found that certain more or less well-defined types of reaction can be recognized as follows:

Superacid, bog peat supporting a characteristic flora of oxylophytes or acid-soil plants; mediacid, some bog peats, many upland peats, and other soils supporting oxylophytes; subacid, ordinary wood and field soils of low acidity; subalkaline, soils derived from limestone rocks; medialkaline and superalkaline, soils in alkaline regions where free sodium carbonate occurs.

Certain general advantages possessed by the proposed methods of stating reactions are discussed, the most desirable feature being the ease with which the relative magnitudes of reactions under comparison can be appreciated. The method is considered to be applicable to all determinations hitherto expressed in terms of pH.

**A simplified wet combustion method for the determination of carbon in soils,** D. D. WAYNICK (*Jour. Indus. and Engin. Chem., 11 (1919), No. 7, pp. 634–637, fig. 1*).—The author, at the California Experiment Station, has modified the apparatus usually used in the wet combustion method in such a way that the carbon dioxide evolved is absorbed in soda lime and can be determined gravimetrically. The reagents used are essentially those employed by Ames and Gaither (E. S. R., 32, p. 805), except that the chromic acid solution contains 3.3 gm. in 5 cc. of water. This amount of chromic acid and 50 cc. of sulphuric acid are used for each combustion.

The essential details of the apparatus are given in the accompanying figure. The air enters the apparatus through A, a tube filled with calcium chlorid.

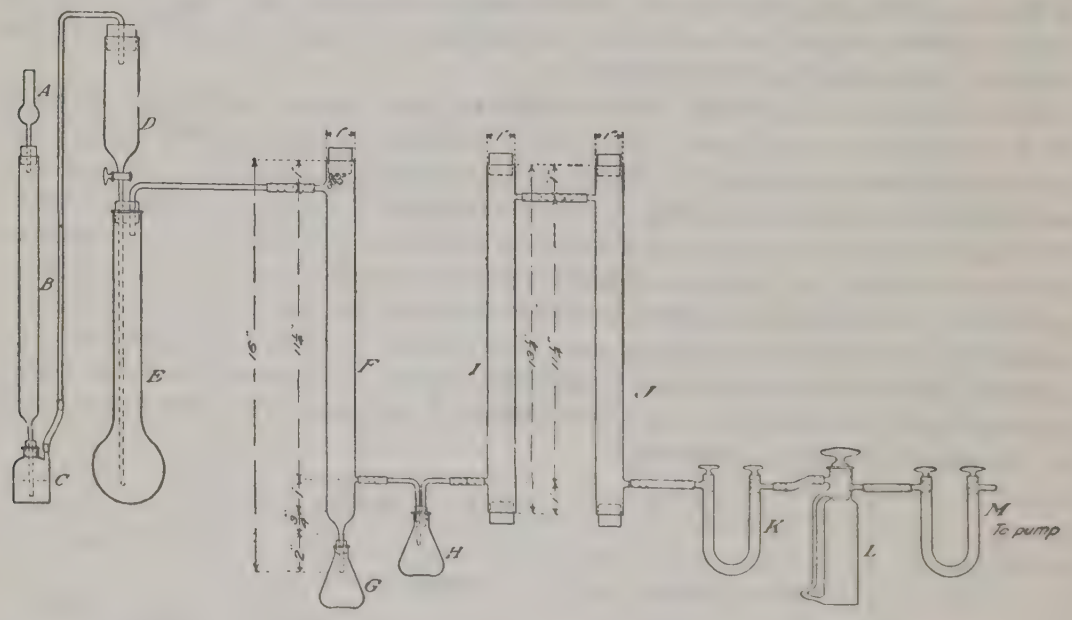


FIG. 1.—Modified apparatus for the wet combustion method.

It then passes through a column of 30-mesh soda lime in B and a small volume of concentrated potassium hydroxid in C, the latter serving as a means of keeping check on the rate of flow of air through the apparatus which is regulated by the stock-cock of D. The dropping funnel D holds the sulphuric acid before its introduction into the 300 cc. combustion flask E. The first of a series of three scrubbers F is filled with glass beads wet with sulphuric acid. This takes the place of the usual condenser and removes most of the sulphur trioxid fumes coming from the combustion flask. The dilute sulphuric acid condensed in F is caught in a 100 cc. Erlenmeyer flask G connected with a second

flask H, to prevent any acid from getting into the scrubber I, filled with 30-mesh zinc amalgamated with mercury. The trap H may be partially filled with a concentrated solution of silver sulphate to remove chlorine which might escape absorption in I. The upper half of J is filled with calcium chlorid and the lower half with phosphoric anhydrid, the two being separated by a layer of glass wool which is also used at the lower openings of all three scrubbers. The air current after leaving J passes through the U tube K filled with calcium chlorid and into the Nesbitt carbon combustion bulb L, filled with 20- to 30-mesh soda lime except for a small space at the top in which is a thin layer of phosphoric anhydrid. The U tube M, filled with calcium chlorid and soda lime, prevents contamination of the combustion bulb by stoppage of the pump. The whole system is connected with a suction pump.

From 5 to 15 gm. of soil and 5 cc. of the chromic acid solution are introduced into the combustion flask. Fifty cc. of sulphuric acid is run into the flask rapidly and sufficient heat applied under the flask to bring the mixture to the boiling point in five minutes. The heating is continued for 20 minutes, during which the aspiration should be so regulated that about 5 liters of air are drawn through the apparatus in the entire time. The aspiration is continued for five minutes after the heat is removed. When cool the absorption bulb L is closed and weighed.

Tables are given showing the accuracy of the method as determined by duplicate analyses and by comparison with other methods. The average error in weighing the combustion tube was about 0.02 per cent in terms of carbon, and the determination itself was subject to about the same error. The total time for the determination is about 25 minutes.

**Analysis of calcium cyanamid with large percentage of dicyandiamid or urea**, I. E. Hene and A. van Haaren (*Ztschr. Angew. Chem., 31 (1918), No. 53, Aufsatzteil, pp. 129–131*).—The method described is said to avoid the error of Caro's method (E. S. R., 25, p. 24) in abnormal samples of calcium cyanamid containing large proportions of dicyandiamid and urea. The technique of the proposed method is as follows:

The sample, the nitrogen content of which should be about 0.2 gm., is dissolved in water, diluted to about 200 cc., and precipitated with 20 cc. of 10 per cent silver nitrate and 30 cc. of 10 per cent potassium hydroxid. The precipitate, which contains all the cyanamid and dicyandiamid and some of the urea, is washed, the filter transferred to 150 cc. of water, and the silver salt dissolved in the smallest possible amount of nitric acid and diluted to 200 cc. Half of this solution is precipitated with 2 cc. of 10 per cent silver nitrate with the addition of 15 cc. of 10 per cent potassium hydroxid. The nitrogen in the precipitate, representing the cyanamid and dicyandiamid, is determined by the Kjeldahl process. The urea nitrogen is estimated in the combined filtrates or, more simply, by difference after determining the total nitrogen. In the other half of the original solution of the silver salt the cyanamid is precipitated by silver nitrate and ammonia. The dicyandiamid is calculated by difference.

**The red iodotannic test**, D. E. Tsakalotos and D. Dalmas (*Bul. Soc. Chim. France, 4. ser., 25 (1919), No. 2, pp. 80–84*).—A further study of the iodotannic test previously noted (E. S. R., 40, p. 610) is reported. With an N/100 solution of iodin the test was found to be more delicate with the tannic reagent than with starch except in the presence of potassium iodid, which in amounts larger than 1 per cent completely inhibits the tannic reaction.

The amounts of iodin and tannin were found to have a marked effect upon the reaction. The maximum intensity is produced when the quantities of iodin and of tannin are in the proportion of 1 cc. of N/10 iodin to from 0.4 to 1.2 of a 1 per cent tannin solution.

**The adulteration of fresh milk with "santen" and condensed milk,** F. WEEHUIZEN (*Meded. Geneesk. Lab. Weltevreden [Dutch East Indies], 3. Ser. A, No. 1–2 (1918), pp. 161–163*).—Attention is called to the sources of error in the Seliwanoff resorcin reaction as applied to sucrose, namely, the decomposition of oxymethylfurfurol when mixed with water and acids and of the aldohexoses on boiling. It is stated that both errors may be avoided by the use of a solution of hydrochloric acid gas in absolute alcohol. This can be prepared conveniently by allowing strong hydrochloric acid to drop on strong sulphuric acid and collecting the gas that is formed in absolute alcohol cooled on ice. The alcohol must be completely saturated and the reagent must not be kept for any length of time.

If to a mixture containing ketohexoses as such or in the form of disaccharids, as cane sugar, 0.05 to 0.1 gm. of resorcin and a few cubic centimeters of the alcoholized hydrochloric acid be added, a dark red color is produced rapidly at ordinary temperatures, while if lactose only is present there is no color change. In applying the test to milk suspected of being adulterated with condensed milk, the following technique is employed:

A mixture of 10 cc. of the milk and 30 cc. of absolute alcohol is shaken thoroughly and filtered. Ten cc. of the filtrate is evaporated nearly to dryness on the water bath, and to the residue are added about 0.05 gm. of resorcin and 3 to 4 cc. of the alcoholized hydrochloric acid. If from 1 to 2 per cent of milk sweetened with sucrose is present, the mixture is colored a light or dark cherry-red within three minutes.

Adulteration with 10 per cent santen (the juice of coconut meat mixed with water) can be detected in the same way by using 20 cc. instead of 10 cc. of the filtrate.

**The loss of moisture from sugar samples under different methods of preservation,** C. A. BROWNE and G. H. HARDIN (*Internat. Sugar Jour., 21 (1919), No. 246, pp. 274–277*).—Various methods of preserving sugar samples were investigated by the New York Sugar Trade Laboratory. The best method, as regards prevention of loss of moisture, was found to be to store the sample in a wide mouth bottle provided with a ground glass stopper sealed with paraffin. It is said that samples prepared in this way can be kept indefinitely without the slightest loss in weight. Another fairly good method makes use of a 6 oz. glass bottle with a 1 in. opening closed with a deep cork and sealed by dipping twice in paraffin.

**The color of sugar cane products and decolorization in factory practice,** F. W. ZERBAN and E. C. FREELAND (*Louisiana Stas. Bul. 165 (1919), pp. 32, figs. 3*).—The literature on decolorizing carbons for 1918 is reviewed, the nature and relative importance of the well-known coloring matters occurring in sugarcane and formed during the manufacturing process are summarized, and a study is reported of the color and of the iron and polyphenol content of sugarhouse products as made by the usual methods of clarification, and by the same processes with the additional use of a decolorizing carbon. These sugarhouse tests were conducted during the grinding season of 1918–19 on a larger scale than those reported in Bulletin 161, previously noted (E. S. R., 39, p. 113).

Five full runs were made and a small sixth run. In the first three the generally accepted sulfitation process for making white sugar in Louisiana was adopted, carbon being used in one run and omitted in the other two. In the fourth and fifth runs, the juice, after being sulphured and limed back to neutrality, was acidified to decided litmus acidity. Carbon was used in one run and omitted in the other. The quantitative determination of coloring matters was

made by the use of the Hess-Ives tint-photometer standardized for the purpose of translating the readings into concentrations.

The results obtained show that the combination of ferric iron and polyphenols plays a very important part in the color of sugarhouse products and that both must be kept at a minimum in order to make a light-colored sugar. To reduce the amount of iron, it is suggested that copper machinery be used to replace iron, or that the iron machinery be painted wherever possible with an iron-free paint resistant to acids, alkalis, and heat. Decolorizing carbons are effective in removing polyphenols and if a sufficient quantity of an active carbon be used the polyphenols, the iron combined with them, and substances giving rise to new polyphenol compounds, may be removed practically completely. The tests showed further that the yield of sucrose in the form of first sugar is slightly better and that the first molasses is of much lighter color where carbon is used than where it is not.

**Pumpkin seeds as a source of oil,** E. W. Albrecht (*Ztschr. Angew. Chem., 31 (1918), No. 53, Aufsatzteil, p. 132*).—The author states that a satisfactory edible oil has been made in Roumania from the seeds of a variety of pumpkin having little flesh and many seeds. These seeds yielded on extraction with benzin and purification from 40 to 42 per cent of their dry weight in oil of a greenish color and pleasing taste. Similar treatment of sunflower seeds yielded from 32 to 36 per cent of a yellow oil suitable for technical, and on purification for edible, purposes.

**Soy bean products and their uses,** C. B. Williams (*Pure Products, 15 (1919), No. 7, pp. 339–345*).—This is a general article from the North Carolina Experiment Station in the interests of growing soy beans in that State. The possibilities of utilizing cottonseed oil mills for the extraction of soy-bean oil are pointed out, and the properties, uses, and value of the soy beans and of the oil and meal derived from them are discussed. The soy bean industry in England, Manchuria, and Japan is described.

**The modification of the composition of vegetable oils, with special reference to increasing unsaturation,** H. L. White (*Jour. Indus. and Engin. Chem., 11 (1919), No. 7, pp. 648–651*).—The author reports an investigation of the possibilities of increasing the unsaturation of vegetable oils, particularly soy-bean oil, by altering conditions of growth in the plant and by the action of bacteria, enzyms, light, heat, etc., on the oil itself.

It was found that the processes of germination and growth of soy beans under different conditions did not alter the amount of unsaturated acids in the ether extracts from such plants. Bacteria isolated from the "foots" of raw linseed oil and enzym extracts from flaxseed and from fresh pigs' liver did not increase the unsaturation of soy-bean oil. Heat, light, and certain catalyzers were also without effect upon unsaturation. Hydrolysis occurred in most cases, the extent depending upon the presence of moisture in the sample of oil.

**Temperature-time relations in canned foods during sterilization,** G. E. Thompson (*Jour. Indus. and Engin. Chem., 11 (1919), No. 7, pp. 657–664, figs. 9*).—This is a preliminary communication outlining methods of procedure for the preparation of reference tables and curves expressing temperature-time relations for various food materials in the cans during the sterilization process.

The procedure used in the experimental work consisted in determining by means of thermocouples embedded in the center of cans of food the temperature-time curves when the cans were subjected to various temperatures in

hot-water, steam, cool air, and cool water. The effect of the size and shape of the container on the heat penetration has been calculated, and the values of the diffusivity, $\frac{\text{conductivity}}{\text{specific heat} \times \text{density}}$, have been found for a number of canned foods. Formulas have been derived for calculating the temperature at any time and at any point in the can under the following conditions: (1) When contents of the can are of uniform temperature throughout before immersion in the sterilizing bath, which is maintained at uniform temperature after the immersion; (2) when the bath temperature, after the can has been put in, increases uniformly to the boiling point and remains constant thereafter; and (3) when the cans are exhausted at one temperature before processing at another.

The results of the experimental work indicate that substances which contain a great deal of free liquid heat almost as fast as water. The change of viscosity with temperature is effective in increasing the heat flow in the steam processing. The effect of the glass can in retarding the heat flow is very marked when the diffusivity is large, but disappears at values less than 0.375.

In addition to tables and curves showing the results of the experimental work, a chart has been devised which may be used for determining approximately the temperature at the center of a can at any time after immersion in the sterilizing bath maintained at constant temperature.

**The action of alcoholic potassium hydroxid on the resins,** P. NICOLARDOT and C. COFFIGNIER (*Bul. Soc. Chim. France, 4. ser., 25 (1919), No. 4, pp. 200–206*).—The action of alcoholic potassium hydroxid upon different resins has been examined by heating 1 gm. of the resin for an hour under a reflux condenser with 25 cc. of N/2 alcoholic potassium hydroxid and adding gradually 50 cc. of distilled water. The insoluble residue was then filtered and weighed.

Of 27 types of resins examined, one only dissolved completely in the N/2 potassium hydroxid. All the others proved to be more or less insoluble in water. In some the amounts of insoluble matter increased and in others decreased on adding water. It is thought that the alcoholic potassium hydroxid forms resinous soaps, some of which are more soluble in the base than in water and others more soluble in water than in the base. It is suggested that this difference in solubility might serve as a new characteristic for the identification of certain resins.

**The alkali industry,** J. R. PARTINGTON (*London: Baillière, Tindall, & Cox, 1919, pp. XVI+304, figs. 63*).—This is one of a series of volumes on industrial chemistry edited by S. Rideal. The book is divided into sections, each of which deals with separate branches of the subject in the manner of a special article or monograph. Following an introductory chapter on the alkali industry in Great Britain, the sections include the salt industry, sulphuric acid, natural soda and the Leblanc process, the ammonia-soda process, electrolytic processes, chlorin and derived products, nitric acid, ammonia and ammonium salts, the oxidation of ammonia, utilization and economy of sulphuric acid, and potassium salts, iodin, and magnesium.

Special attention has been given throughout to the resources and needs of the British Empire and possible future independence of German supplies.

## METEOROLOGY.

**A soil temperature survey of the United States and Canada,** F. SHREVE (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 79, 80*).—The survey previously referred to (E. S. R., 41, p. 16) is briefly described. The com-

mittee consists of F. Shreve and A. E. Cameron. During 1917 more than 30 stations were maintained in portions of Canada and practically all parts of the United States, and at most of these nearly complete records for the year were secured.

**Report of the department of meteorology**, J. E. Church, jr. (*Nevada Sta. Rpt. 1918, pp. 50–52, fig. 1*).—This is mainly a brief account of progress in the snow surveying and forecasting work which has been carried on by the department for several years. Attention is called especially to the accuracy of forecasts of stream flow based on snow surveys.

**Climate and meteorology [of Canada]**, F. Stupart et al. (*Canada Yearbook, 1918, pp. 154–165*).—This article summarizes the principal climatic events and conditions of Canada since confederation, and the weather of each month of 1917.

**Climate of Sao Paulo**, J. N. Belfort Mattos (*Bol. Agr. [Sao Paulo], 19. ser., No. 5–7 (1918), pp. 507–562*).—The climatic characteristics as related to health and plant growth of different districts of the State are discussed on the basis of observations extending over various periods up to 28 years.

**The lunar tide in the atmosphere**, S. Chapman (*Nature [London], 103 (1919), No. 2584, pp. 185–187, fig. 1*).—This article briefly discusses the lunar semidiurnal tide in the atmosphere at Greenwich, as determined from the Greenwich records of barometric pressure, 1854–1917.

**The lunar tide in the earth's atmosphere**, S. Chapman (*Quart. Jour. Roy. Met. Soc. [London], 45 (1919), No. 190, pp. 113–139, fig. 1*).—This article reviews present knowledge on the subject and discusses "certain new determinations of the lunar diurnal variation of barometric pressure for Batavia and Hongkong." The variation is attributed to tidal action of the moon on the earth's atmosphere, certain unexpected features of which, of theoretical interest, are dealt with in some detail.

**Atmospheric pollution**, J. W. Redway (*Quart. Jour. Roy. Met. Soc. [London], 45 (1919), No. 190, pp. 167–169*).—Studies made at Mount Vernon, N. Y., showing the menace to health of the wind-blown dust of city streets are briefly discussed.

## SOILS—FERTILIZERS.

**Reconnoissance soils survey of the Middle San Joaquin Valley, Cal.**, L. C. Holmes, E. C. Eckmann, J. W. Nelson, and J. E. Guernsey (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 115, pls 3, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 2,846,720 acres lying near the geographical center of the State and comprising parts of Fresno, Tulare, and Kings Counties. The area includes approximately the central third of the San Joaquin Valley. Previous surveys dealing with the Sacramento Valley (E. S. R., 34, p. 120) and the Lower San Joaquin Valley (E. S. R., 40, p. 118), together with the present survey, constitute a reconnoissance of the Great Interior Valley.

The topography of the region is somewhat mountainous. Natural drainage is said to be well established on the upper valley slopes but inadequate over extensive lower areas. The soils of the area comprise residual material from the underlying consolidated rocks, old valley-filling and coastal plain material, recent alluvial material, and wind-laid material. In addition to rough stony land 38 soil types representing 19 series are mapped. Panoche loams, occupying 12.6 per cent of the total area, are the prevailing types.

**Soil survey of the Santa Maria area, Cal.**, F. B. Watson and A. Smith (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 48, pls. 4, fig. 1,*

*map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 189,440 acres situated in the southwestern part of the State and including the northwestern part of Santa Barbara County and the southwestern part of San Luis Obispo County. The region comprises the Santa Maria Valley, the Nipomo Mesa lying from 100 to 200 ft. above the valley floor, and the Arroyo Grande Valley, together with the intervening hills and parts of the adjacent mountains.

With respect to their origin the soils of the area are said to be residual from underlying consolidated rocks, derived from coastal plain and old valley-filling material, eolian, recent-alluvial, and miscellaneous. In addition to coastal beach and dunesand, riverwash, rough, broken, and stony land, and peat, 32 soil types of 12 series have been mapped. Oakley sand, occupying 16.2 per cent of the total area, is the prevailing type.

**Soil survey of Saratoga County, N. Y.**, E. T. MAXON and J. H. BROMLEY (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 42, fig. 1, map 1*).—This survey, made in cooperation with the New York State College of Agriculture, deals with the soils of an area of 526,720 acres situated in the east-central part of the State. The topography of the region varies from smooth plains in the eastern part to rolling uplands in the southern and southwestern part. The elevations range from about 200 to 2,600 ft. above sea level. Natural drainage is well established.

The soils of the county are of glacial origin, the upland soils consisting of glacial till or sediments laid down in lakes or as outwash plains. Exclusive of rough stony land and muck, 27 soil types of 13 series are mapped. Gloucester stony fine sandy loam, Merrimac fine sand, rough stony land, and Dutchess loam, occupying 20.8, 19.4, 11.8, and 10.5 per cent of the total area, respectively, prevail.

**Agricultural conditions and land classification in the south half of Minnesota**, F. LEVERETT and F. W. SARDESON (*Univ. Minn., Geol. Survey Bul. 14 (1919), pp. 45–62, pls. 2, fig. 1*).—This is a brief outline, particularly as related to their geological origin, of certain of the characteristics and agricultural possibilities of different classes of lands of the southern half of Minnesota, "beginning with the driftless area and taking up the several drifts and associated deposits in order of their age and the alluvial deposits of the present streams." A table is given showing percentages of improved land in each county of the area by decades, 1870–1910, with notes on the dominant soils and vegetation.

**Peat and muck soils**, J. W. AMES (*Mo. Bul. Ohio Sta., 4 (1919), No. 5, pp. 161–165*).—The formation and composition of peat and muck soils in Ohio are briefly described and their fertilization, drainage, claying, and adaptation to crop production discussed. A tabular statement is presented showing the chemical composition of 18 representative samples of such soils occurring in the State.

**Nitrification in moor soils**, T. ARND (*Centbl. Bakt. [etc.], 2. Abt., 49 (1919), No. 1–4, pp. 1–51*).—The author discusses at some length the work of other investigators relative to the subject, together with the results of his own observations on the influence of lime upon nitrification in both high and low moorland soils and on the occurrence of nitrite- and nitrate-forming organisms in these soils.

He concludes that in raw, unlimed, high, and low moor soils of acid reaction no nitrification takes place. Small applications of lime, insufficient to correct acidity, failed to stimulate nitrification, whereas sufficent lime to insure neutralization is said to have so improved the physical conditions of the soil as

to produce a favorable environment for the activities of the nitrifying bacteria. Increasing the amount of lime beyond the point necessary for neutralization did not retard nitrification, although the final total nitrate content of the soil in many cases was found to be less than where smaller applications of lime were made. This was thought to be due to increased ammonia and nitrate assimilation and nitrate reduction through stimulated microbial activities. Low moor soils of neutral reaction required no liming to stimulate nitrification.

With respect to the presence of nitrifying organisms in high moor soils, it is stated that where the soil acidity was reduced through the chemical reaction of the basic elements of a phosphate fertilizer, nitrate formers were completely lacking. Applications of lime made at the rate of 1,000 kg. of calcium oxid per hectare (about 890 lbs. per acre) failed to stimulate the development of nitrifying organisms except in the immediate vicinity of the lime particles. An application of 2,000 kg. resulted in a further increase in nitrifiers, attributed to an increase in the number of spots rich in lime. The nitrifying activities of a moor soil thus treated are said to have been considerably less than in a normal mineral soil.

**Nitrogen contents of cacao soils planted with and without bois immortel shade**, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 1, pp. 6–8*).—Determinations of the total nitrogen and of nitrate nitrogen in cacao soils shaded with Erythrina and in similar soils without shade were made at quarterly intervals during 1918 to ascertain whether the immortel was beneficial to the cacao in producing a larger supply of nitrogen in the soil.

The shaded soils showed a range in total nitrogen of from 0.078 per cent in June to 0.129 per cent in December, and in nitrates from 0.00062 per cent in September to 0.00093 per cent in March. In the unshaded soil the total nitrogen ranged from 0.091 per cent in September to 0.115 per cent in December, and the nitrates from 0.00042 per cent in September to 0.00077 per cent in December.

**The organic phosphorus of soil**, R. S. POTTER and R. S. SNYDER (*Soil Sci., 6 (1918), No. 4, pp. 321–332, figs. 2*).—This paper, a contribution from the Iowa Experiment Station, describes further investigational work planned to determine whether the method proposed by Potter and Benton (E. S. R., 36, p. 212) actually differentiates between the organic and inorganic phosphorus in the soil, this point having been questioned by Gortner and Shaw (E. S. R., 37, p. 121), together with observations on the nature of certain organic phosphorus compounds.

An examination of a subsoil taken 3 ft. below the surface and containing no organic matter but a considerable amount of colloidal clay failed to show any so-called organic phosphorus, which is held to indicate that the latter was not confused with colloidal clay in applying the method under observation. The addition of phytin to the soil did not result in its extraction to any appreciable extent with a 1 per cent hydrochloric acid solution.

Hydrolysis curves for phytin and nucleic acid were determined, hydrolysis being effected with 5 per cent sulphuric acid at 100° C. The curve for phytin was found to be a straight line and after two hours that for nucleic acid approximated a straight line, showing both reactions to be of the first order. Curves for the hydrolysis of the organic phosphorus of Carrington silt loam and two samples of Miami silt loam soil were also ascertained. The results are deemed to be rather inconclusive, except that nucleic acid was evidently absent except in the Carrington silt loam and then was present only to a slight extent. The directions of the curves are said to have been such that the organic phosphorus may have been due to phytin or to a pyrmidin nucleotid.

A list of references comprising 16 titles is appended.

**The movement of plant food within the soil**, E. VAN ALSTINE (*Soil Sci., 6 (1918), No. 4, pp. 281–308*).—This paper, a thesis presented to the Graduate School of the University of Illinois, describes investigations in which a study was made of the total amount of the various plant food elements present in samples of soil from long-time fertilizer plats, including the "park" plats at Rothamsted and the plats of the Pennsylvania and Ohio experiment stations, in order to determine the ultimate fate of the fertility elements added to the soil as fertilizers when not completely removed by the crop. The total amount of organic carbon, ntirogen, phosphorus, potassium, magnesium, and calcium was determined in the Rothamsted soil for samples representing strata of from 0 to 3 in., 3 to 6 in., and 6 to 9 in., respectively. In the case of the Pennsylvania and Ohio soils the observations were confined to a study of the phosphorus content of strata from 0 to 6⅔ in., 6⅔ to 13⅓ in., and 13⅓ to 20 in.

Summarizing the results secured, the author concludes that "when phosphorus is used as a fertilizer, it remains almost where it is placed in the soil until removed in crops or removed by some such process as erosion by water or wind action. The addition of alkali salts (sulphates of potash, soda, and magnesia) seems to encourage the utilization of phosphorus from the surface stratum, especially by legume plants, which probably also secure nitrogen chiefly from the soil air in the surface stratum. There may be some loss of nitrogen through drainage, but when other fertility conditions are right and crops are kept on the ground all through the growing season, this loss is very small and there is a tendency for nitrogen, added in the form of ammonia, to accumulate in the surface soil, probably in plant roots and residues. Potassium, though easily and quickly fixed in soil, is more subject to movement within the soil as a result of fertilizing with other salts and in this way may be leached beyond the reach of plant roots. Carbonates are rather easily washed from the soil even when no other treatment is given, but much more readily washed out when ammonium salts are used. The loss of magnesium is brought about by the use of ammonium salts as fertilizers. Calcium decreases with the loss of carbonates. Also, when alkali fertilizer salts are applied, it decreases more rapidly than acidity develops. Ammonium salts cause as marked a loss of calcium as of carbonates, and its loss occurs relatively as rapidly as the acidity develops."

A list of the references cited, comprising 45 titles, is appended.

**The presence of aluminum as a reason for the difference in the effect of so-called acid soil on barley and rye**, B. L. HARTWELL and F. R. PEMBER (*Soil Sci., 6 (1918), No. 4, pp. 259–279, figs. 2*).—This paper, a contribution from the Rhode Island Experiment Station, describes investigations made in an effort to ascertain the cause of the unlike effect of acid soils on different kinds of plants. Rye was selected as a plant which grows well on acid soils and barley as one which is materially injured by the same conditions.

Seedlings of both rye and barley were found to be affected about the same by a given amount of acidity in connection with a nutrient culture in either water or sand, while sterilization of the soil either with heat or toluol failed to produce any change which with certainty influenced differently the two kinds of seedlings. Hydrogen peroxid, dihydroxystearic acid, manure extract, ammonium sulphate, potassium permanganate, chromium, and silicon affected the two plants about alike, while an aqueous extract of an acid soil affected them the same as the acid soil itself. The toxic principle of the extract was concentrated in the residue upon distilling, the distillate being nontoxic. Both the dialyzate and diffusate resulting from dialysis of the extract had the same effect upon rye and barley, while the ash of the soil extract, when brought into solution, had the same effect as the acid soil.

A search for the active factor then being made among the inorganic constituents, aluminum was found to be responsible for the different influence upon the plants. When equivalent amounts of aluminum sulphate and sulphuric acid were added to an optimum nutrient solution, both produced the same depression on the growth of barley. Sulphuric acid caused a similar depression of rye, but aluminum sulphate had very little effect. Since the nutrient solution containing the acid possessed about four time the H-ion concentration of that containing aluminum sulphate, the toxic effect of the latter on barley was attributed largely to the aluminum.

Finally, it is stated that "treatment of an acid soil with either phosphoric oxid or acid phosphate reduced the amount of active aluminum in the soil. Unusually large additions of acid phosphate caused remarkable growths of plants so sensitive to an untreated acid soil that previously no growth was possible, and this was in spite of the fact that the acidity of the soil was very much increased by the acid phosphate. The active aluminum, however, was much decreased by the treatment. The results indicate that the practical advantage of phosphating and liming may often prove to be due to the precipitation of active aluminum quite as much as to supplying phosphorus as a nutrient and lime as a reducer of acidity."

**The influence of heated soils on seed germination and plant growth**, J. Johnson (*Soil Sci., 7 (1919), No. 1, pp. 1–103, figs. 16*).—Supplementing work previously noted (E. S. R., 35, p. 722), the author describes a series of investigations conducted at the Wisconsin Experiment Station to ascertain primarily the nature of the action of sterilized soils upon plant growth.

The evidence is held to demonstrate the importance of microorganisms in the loss of toxicity in the soil and that reduced toxicity is due to biological action upon ammonium carbonate, resulting in the liberation of gaseous ammonia or its fixation in the soil. The soils employed in the study included Waukesha silt loam, Miami silt loam, Norfolk sand, virgin sandy loam, fine sandy loam, red clay, muck, and peat, and were subjected to widely varying treatments and conditions, and their action on numerous seeds and plants determined. The data are presented in tabular form and fully discussed, together with confirmatory evidence found in the literature bearing on some of the conclusions presented in this paper. The results secured may be summarized as follows:

Heating soil to different temperatures usually resulted in a gradual increase in toxicity to seed germination and to early plant growth which reached its maximum at approximately 250° C., but gradually decreased to practically no toxicity on soils heated to 350° or above. The time required for recovery from this toxic action was usually directly proportional to the intensity of toxicity produced, but the final beneficial action was often greatest on soils exhibiting the greatest injurious action on early plant growth. Different soils varied markedly in their behavior upon heating to the same temperature both in toxicity and in beneficial action to seeds and plants, this apparently not being correlated with any single distinguishing character in the soil but rather with the balance of all the factors concerned.

Seeds varied greatly in their sensitiveness to the toxic action, the degree of sensitiveness being roughly characteristic of their genetic relationship. The Graminæ and the Cucurbitaceæ were usually resistant, and the Leguminoseæ and Solanaceæ were, so far as determined, more susceptible.

With seeds resistant to the toxic action, marked acceleration of the rate of germination may occur on even highly heated soils, this being regarded as another expression of the same substances that cause retardation in more susceptible seeds. Seeds classed as susceptible may, on the other hand, show

accelerated germination on soils not productive of high toxicity on heating or upon heating soils to low temperatures only.

Growing plants differed markedly in their sensitiveness to the action of heated soils. The similarity of their behavior and of germinating seeds in this respect suggested that the injurious and beneficial substance in both cases may be the same, although toxicity to seed germination did not appear to be always correlated with toxicity to plant growth and vice versa. Sensitiveness of seeds to the toxic agent in germination was also not indicative of the behavior of the same species in its growth on the same soil. The growth of fungi on heated soil was correlated with toxicity to seed germination and plant growth on any one soil, the development of Pyronema having been studied in particular. This and other fungi and apparently bacteria also grew best in soil heated to 250°, diminishing in rate and profuseness of growth at lower or higher temperatures of heating.

The ammonia content of soil heated to different temperatures was highest on heating to about 250°, and diminished gradually at higher and lower temperatures, this also being true for the concentration of the soil solution. Ammonia content and concentration of the soil solution were, therefore, roughly correlated with the degree of toxicity to seed germination and early plant growth and the extent of the beneficial action to late growth of green plants and to growth of lower microorganisms in any one soil, although there was apparently no correlation between these factors when different soils were compared with each other.

The absorptive capacity of different soils varied greatly, this in turn markedly influencing the action of toxic compounds produced in the soil. In water extracts of heated soils, the toxicity to seed germination was more directly proportional to the ammonia content, indicating that the toxicity of the soil was not only determined by the amount of the toxic agent produced by heating but also by the absorptive capacity of the soil for the toxic agent, as well as by a number of other factors the additive and subtractive value of which gave balance of toxicity very difficult to analyze properly.

The addition of ammonia as such to soil in varying amounts is said to be capable of producing a condition similar in many respects to that produced by heated soils on seed germination and plant growth. It was found that similar "qualitative" reactions can be produced with certain seeds on highly toxic heated soils or their extracts and with certain strengths of ammonia, these reactions not appearing to be reproducible with chemicals other than ammonia or ammonium salts.

It is believed that much of the toxic action in heated soils is due to the ammonia produced and that it exists in heated dry soils largely as ammonium carbonate, which is, however, gradually decomposed under normal growing conditions. All toxic properties in heated soils are not, however, believed to be the same, certain changes termed "chemical" injuries seemingly being due to quite different causes than ordinary retardation. The toxic property was found to be volatile, and to be destroyed or changed to nontoxic compounds in soils kept under normal-growing conditions due to the activity of ordinary soil flora, which, however, may apparently at the same time increase the amount of ammonia present. *Pyronema confluens* has also been shown to be efficient in both these respects. Reduced toxicity in the presence of increased ammonia content in the soil is believed to be explained by the existence of the ammonia in various delicate transition stages rather than as true ammonia due to the activity of soil organisms, these transition products being broken down when the ammonia determinations are made. The

reduction of the toxic property to seed germination and plant growth by the activity of soil flora has been demonstrated, and is held to be contrary to Pickering's conclusion that loss of toxicity in storage of heated soils is an oxidation process which may go on under aseptic conditions (E. S. R., 24, pp. 420, 421).

The beneficial action of highly heated soils is believed to be due largely to the ammonia liberated on heating, since increased growth may result in almost total absence of nitrates or in heated soil under aseptic conditions in spite of a considerable toxic action upon the roots. That certain green plants are capable of utilizing nitrogen in the form of ammonia is believed partially to explain the variation of sensitiveness of plants to heated soils. The temperature of the soil was shown to be an important factor in determining the extent of the toxic and beneficial action to plant growth, the toxic action disappearing more slowly and being more destructive at low soil temperatures (below about 25°) than at higher temperatures.

Observations on the growth of Pyronema are held to indicate that the favorableness of heated soils to its growth is not entirely one of concentration of soil solution, as argued by Seaver and Clark (E. S. R., 23, p. 629; 27, p. 620), since Pyronema grew on heated soils very low in concentration as compared with other unheated soils on which growth never occurred. All microorganisms appeared to grow better on soils having a high concentration of soil solution due to increased food supply, but the type of organism and the extent of its growth varied with the competition at hand and the kind of food materials present. Fungi differed in their food requirements in much the same way as green plants, and heating the soil is thought to produce chemical substances specially favorable to the growth of Pyronema.

The conclusions reached are deemed applicable particularly to highly heated soils, although it is not believed that any fundamental difference exists between ordinary steam-sterilized soils and highly heated soils reinoculated with normal-soil flora. "Although the injurious action of heated soils on plant growth has been brought into the foreground in this paper, it is not desired to leave the impression that heat-sterilized soils are of questionable value in research and practice. The opposite is rather true, and little hesitancy need be felt in recommending steam sterilization of soil for practical purposes or for use in research problems where it is necessary to eliminate certain organisms from the soil. But one must be prepared to expect a short period of retardation of growth, followed by a beneficial action, and in special cases, with certain soils or plants or under certain environmental conditions, a very marked interference with the normal development of plants."

A list of references comprising 79 titles is appended.

**The actinomyces of the soil**, S. A. Waksman and R. E. Curtis (*Soil Sci., 1 (1916), No. 2, pp. 99–134, pls. 3, fig. 1*).—In this paper, a contribution from the New Jersey Experiment Stations, the authors demonstrate the presence of Actinomycetes in different types of soil and attempt a classification of the organisms according to their morphological and physiological characters. More than 100 organisms were isolated, representing 30 species which are described and a key prepared for their identification. A list of references comprising 23 titles is appended.

**The occurrence of Actinomycetes in the soil**, S. A. Waksman and R. E. Curtis (*Soil Sci., 6 (1918), No. 4, pp. 309–319*).—Supplementing the work noted above, information is given concerning the number of Actinomycetes and bacteria occurring in 25 soils from different sections of North America and from the Hawaiian Islands previously described (E. S. R., 36, p. 214), together with

notes on the isolation of various species of Actinomycetes from certain of these soils.

The number of Actinomycetes developing on albumin agar ranged from 7,500 in Jamesburg cranberry soil from New Jersey to 2,400,000 in a cultivated Oregon adobe-like soil. As compared with the total number of bacteria and Actinomycetes developing on the same media, the percentage of Actinomycetes ranged from 3.5 for the Jamesburg cranberry soil to 46 for Alberta (Canada) garden soil. The average number of Actinomycetes for all the soils examined amounted to 870,500, or 17 per cent of the total flora. It is stated that heavy soils and those rich in undecomposed organic matter generally contain a relatively larger number of Actinomycetes than corresponding lighter soils or soils poor in undecomposed organic material. The isolation of 28 distinct species of Actinomycetes from 20 different soils is held to demonstrate their general distribution in North America and the Hawaiian Islands.

A list of references comprising 25 titles is appended.

**Illinois crop yields from soil experiment fields**, C. G. HOPKINS, F. W. GARRETT, J. E. WHITCHURCH, and H. F. T. FAHRNKOPF (*Illinois Sta. Bul. 219 (1919), pp. 401–503*).—Tabulated data are presented giving the detailed results from 38 Illinois soil experiment fields through the season of 1917. The methods of cropping and soil treatment are briefly indicated, more detailed information being given in a previous publication (E. S. R., 36, p. 618).

**Commercial fertilizers for Indiana: What to use**, A. T. WIANCKO (*Indiana Sta. Circ. 92 (1919), pp. 7, figs. 2*).—A tabular statement is presented showing the fertilizer formulas deemed best for different crops and for various soil conditions in the State, as indicated by extensive soil fertility investigations conducted by the station. The composition of the soil, the requirements of the crop, and the practice regarding the use of manure and legumes in the rotation form the basis for classification. Brief notes are included on the interpretation of fertilizer formulas, the estimation and comparison of fertilizer values, the home mixing of fertilizers, and the amount of fertilizer to use.

**The agricultural value of organic manures**, E. J. RUSSELL (*Jour. Bd. Agr. [London]. 26 (1919), No. 3, pp. 228–247, fig. 1*).—Experiments at Rothamsted with Peruvian guano, rape cake, and shoddy, as compared with other nitrogenous fertilizers, are briefly reviewed.

The relative effectiveness of the three fertilizers was Peruvian guano 100, rape cake 91, and shoddy 88. Shoddy showed a residual effect which would improve its relative standing. There was no evidence that the nitrogen in rape cake is superior in crop producing power to that of sulphate of ammonia, and it was less effective than that of nitrate of soda. There was little evidence that rape cake and Peruvian guano permanently benefit the soil. As far as fertilizing value is concerned, there appears to be "no reason why rape cake and guano should ever sell at prices above those obtaining for sulphate of ammonia and nitrate of soda."

**How the nitrogen problem has been solved**, H. J. M. CREIGHTON (*Jour. Franklin Inst., 187 (1919), Nos. 4, pp. 377–408; 5, pp. 529–619; 6, pp. 705–735, figs. 20*).—This article describes and discusses the advantages and disadvantages of five different methods which have been proposed for fixation of atmospheric nitrogen as follows: "(1) The direct oxidation of nitrogen to its oxids with subsequent formation of nitric acid or nitrates, as exemplified in the arc processes, (2) the direct combination of nitrogen with hydrogen to form ammonia, as typified by the Haber process, (3) the absorption of nitrogen by carbids, as developed in the cyanamid process, (4) the absorption of nitrogen by metals in the form of nitrids, as represented by the Serpek process, and (5)

the conversion of nitrogen into cyanids, as set forth in the Bucher process." Processes for oxidation of ammonia to nitric acid are also discussed. It is stated that at the present time the first three of the methods named "are successfully operated on a commercial basis," but that the Bucher process has scarcely passed beyond the experimental stage.

"During the past five years rapid progress has been made in the fixation of atmospheric nitrogen, especially by the cyanamid process and by the direct synthesis of ammonia. As a result of this advance, greatly stimulated by the war, nearly one-third of the nitrogen used by the Allies for military explosives in the autumn of 1918 was obtained from the atmosphere."

The annual production capacity of the world for synthetic nitrogen compounds is given as 75,000 tons in 1914 and 389,000 tons in 1918. It is estimated at 467,000 tons for 1919. The production in the United States is given as nothing in 1914, 55,000 tons in 1918, and estimated at 100,000 tons in 1919, mainly in form of cyanamid (46,000 tons in 1918 and 91,000 tons in 1919).

A very full classified bibliography of the subject is given.

**Production of ammonia from lime nitrogen, and the time yield under various conditions,** W. Grahmann (*Ztschr. Elektrochem., 24 (1918), No. 23–24, pp. 385–391, figs. 2; abs. in Jour. Chem. Soc. [London], 116 (1919), No. 677, II, pp. 105, 106*).—The rate of production of ammonia from boiling mixtures of lime nitrogen and water, lime nitrogen and sodium hydroxid or carbonate of various strengths, and lime nitrogen and potassium hydroxid or carbonate of varying strengths was determined.

The rate of decomposition of calcium cyanamid in water was very slow in all concentrations at the boiling point and atmospheric pressure. Alkali hydroxids or carbonates accelerated the reaction. Under a pressure of 30 atmospheres and a temperature of 150° C. the decomposition was rapid even without the addition of alkali until 75 per cent of the cyanamid was decomposed, after which the rate of decomposition greatly declined.

**America's advance in potash production,** W. C. Ebaugh (*Bul. Sci. Labs. Denison Univ., 19 (1919), Art. 2, pp. 33–64, figs. 2*).—It is stated that the production of potash in the United States increased from practically nothing in 1914 to 52,135 tons of actual potash in 1918. The estimated production capacity of American potash plants is given as 100,000 tons annually, or 40 per cent of the normal consumption. The various domestic sources of potash are briefly described.

**Trade and fraud in commercial fertilizers,** A. Pompeu do Amaral (*Bol. Agr. [Sao Paulo], 19. ser., No. 5–7 (1918), pp. 492–506*).—This article discusses briefly the various sources and kinds of commercial fertilizing materials, the valuation of fertilizers, and the falsifications to which they are subject. It recommends especially to coffee planters the cooperative buying of fertilizers on guaranty of quality, appealing to the Agronomic Institute of Sao Paulo in case of dispute.

**Report of analyses of samples of commercial fertilizers collected by the commissioner of agriculture during 1918** (*New York State Sta. Bul. 452 (1918) pp. 203–253*).—This reports the results of the actual and guaranteed analysis of official samples of fertilizers and fertilizing materials collected during 1918.

## AGRICULTURAL BOTANY.

**The flora of the American Virgin Islands,** N. L. Britton (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 19–118, fig. 1*).—Lists comprising 890 Spermatophyta and 41 Pteridophyta are thought to be practically complete. Lists including 46 Bryophyta and 75 lichens are thought to be less complete. Endemic plants comprise only about 2.6 per cent of the native flora.

**Geobotany of the Santa Lucia Mountains,** F. SHREVE (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 78, 79*).—An examination has been made of the Santa Lucia Mountain region in California, which embraces chiefly or entirely the distributional areas of *Pinus radiata, Abies venusta, Cupressus macrocarpa,* and *C. goveniana,* as well as the southernmost localities of *Sequoia sempervirens* and a number of its associates. While geomorphic movements undoubtedly lie at the basis of the present distributional features, a good opportunity is offered for investigation of the factors controlling reproduction and life history of all these endemic forms.

**The vegetation of an imperfectly drained desert valley,** F. SHREVE (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 76–78*).—Field and laboratory work has been inaugurated with the view of investigating the rôle played by the soil in determining the differences of vegetation which characterize the Avra Valley of Arizona. The fact that this valley is not undergoing the normal course of physiographic development, being subject to frequent checks and reversals of such development, makes it a particularly suitable area for investigation of such a problem.

**Isolation and specific change,** E. W. SINNOTT (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 444–447*).—Data are presented and discussed to show that isolated regions are characterized by the presence of large numbers of local, or endemic, genera and species.

Endemism was not equally distributed among the plant groups in the insular floras investigated. The local species and genera were rare among vascular cryptogams and glumaceous monocotyledons but very common among petaloideous monocotyledons and dicotyledons, this fact supposedly indicating that the environment, whether acting directly or through natural selection, has not been the determining factor in the development of endemic forms. Those groups which are poor in endemics are predominantly self-fertilized, those which are rich in endemics predominantly cross-fertilized, these facts suggesting that hybridization has been the predominant factor in the development of these new forms. Isolation is, therefore, regarded not as a factor which, by providing a simple, limited, and peculiar environment, produces local species and genera, but merely as a factor which, by prohibiting dispersal, maintains the endemic character of local types which have originated through other causes.

**Osmotic concentration of tissue fluids in relation to geographical distribution,** J. A. HARRIS (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 86, 87*).—This work, continued along lines previously indicated (E. S. R., 40, p. 130), has shown that the osmotic concentration of the tissue fluids of epiphytic Bromeliaceæ, Orchidaceæ, Piperaceæ, and Gesneraceæ is lower than that of the terrestrial vegetation. The problem of the osmotic concentration of the tissue-fluids of cryptogamic epiphytes is to be made a subject of further study.

**On the osmotic concentration of the tissue fluids of phanerogamic epiphytes,** J. A. HARRIS (*Amer. Jour. Bot., 5 (1918), No. 9, pp. 490–560*).—This is a more extended account than that above noted.

**Endurance of extreme conditions and its relation to the theory of adaptation,** W. J. V. OSTERHOUT (*Amer. Jour. Bot., 5 (1918), No. 10, pp. 507–510, fig. 1*).—The author reports that a species of Tradescantia lived for nearly two years without soil or water, growing vigorously afterwards in a saturated atmosphere, and was finally placed under water for a month, being alive at the end of the experiment. It is thought that the explanation of such cases must be sought in physical or chemical conditions of the protoplasm which arise without reference to direct adaptation, and it is suggested that the same kind of explanation may apply to many cases which are now regarded as adaptations.

Investigations on the imbibition of water by gelatin, E. B. Shreve (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 74–76*).—This is a continuation of work previously noted (E. S. R., 40, p. 27). It is said to have shown that it is not safe to draw conclusions regarding the effect which substances within a jelly exert upon its imbibitional capacity when evidence for such a conclusion lies in the known effect of an external solution of the same substance on that jelly. This applies to the theories involving the physicochemical effect of the substance upon the gelatin itself, as well as those concerning physiological phenomena.

The effect of organic acids and their amido compounds on the hydration of agar and on a biocolloid, D. T. MacDougal and H. A. Spoehr (*Proc. Soc. Expt. Biol. and Med., 16 (1918), No. 3, pp. 33–35*).—A series of test measurements was carried out in the equable temperature chambers of the Coastal Laboratory from August to November, 1918, on three groups of substances, (1) succinic acid and its amido compound, α amino succinic or aspartic acid, which are dibasic, and its amid, asparagin, which is monobasic; (2) acetic acid and amino acetic acid or glycocoll, which are monabasic; and (3) propionic acid and α amino propionic acid or alanin, also monobasic; data were obtained which are here partly tabulated with brief discussion.

It is stated that equimolecular concentrations of the three organic acids present a small divergence of effect on agar and a more positive difference in agar protein. Agar swells more in succinic acid than in its amido compound, but this relation is reversed in the acetic-glycocoll couple and in the propionic-alanin pair. Equimolecular concentrations of amino acids produce notably greater swellings of the biocolloids in comparison with related organic acids, implying the positive action of factors other than the H-ion concentration. Glycocoll facilitates hydration in all concentrations above 0.01 M. in both agar and agar proteins, and also in agar gelatin. Asparagin induces a maximum hydration.

The absorption of calcium salts by squash seedlings, R. H. True and R. B. Harvey (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 502–512, figs. 3*).—During work participated in by True (E. S. R., 36, p. 128), it was found that the rate of absorption of electrolytes by seedlings from solutions of the usual mineral nutrients was influenced largely by the chemical character of the substances offered. It appears that the usual salts of potassium were not absorbed, producing rather an outgoing current of ions from the seedlings into the solution. In case of more dilute magnesium solutions a slight absorption took place, while in calcium solutions absorption was more considerable and occurred in the most dilute solutions.

In preliminary experiments by the present authors some exceptional behavior was observed. Results of a series of experiments as here recorded are considered to show that for both squash and white lupine in the seedling stage the calcium ion favors the absorption of ions. The differences in behavior of the two plants are detailed. The strong influence exerted by the specific characteristerics of the different species of plants is shown by the contrasting behavior of the lupine and the squash in the presence of calcium accompanied by the $NO_3$ ion. It is considered as clear from the evidence shown that any theory of cell permeability framed to account for the income and outgo of the living plant with respect to electrolytes must take into account the striking differences that exist in the behavior of plants toward even such fundamental factors as the required mineral nutrient ions.

The nucleus as a center of oxidation, W. J. V. Osterhout (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 342–347*).—A study is detailed as made by the author on leaf cells of Indian pipe (*Monotropa uniflora*), which after being injured

turn dark. This change, which is interpreted as an oxidation effect, is much more rapid in the nucleus than in the cytoplasm. The facts are held to indicate that this is also the case with oxidation of the uninjured cell.

Studies on the production of matter in light and shadow plants, P. B. JENSEN (*Bot. Tidskr., 36 (1919), No. 4, pp. 219–259, figs. 7*).—A study of a light plant (*Sinapis alba*) and of a shadow plant (*Oxalis acetosella*) is said to have shown that carbon dioxid assimilation and daily production of dry matter are very much more rapid in the former than in the latter. The equilibrium point between assimilation and respiration is reached at a light intensity of 1.0 (Bunsen units×100) for the former and at 0.2 for the latter.

The luminescence of Pseudomonas luminescens, A. DE COULON (*Étude de la Luminescence du Pseudomonas luminescens. Thesis, Univ. Neuchatel, 1916, pp. 95, figs. 18*).—Results of a study of *P. luminescens* as here detailed are claimed to show that bioluminescence is independent of respiration, but ceases with the death of the cell. The phenomenon is intracellular, depending upon oxygen which becomes available, though it is not known whether the oxygen is furnished by the atmosphere or by intracellular chemical processes. Ethyl alcohol at 6.2 per cent or methyl alcohol at 10 per cent concentration, lowering surface tension and semipermeability and permitting the diffusion inward of oxygen, increases the duration of luminosity. Potassium cyanid augments semipermeability but hinders respiration, resulting in the retention of oxygen by the cell. Hydrogen and hydroxyl also affect permeablity and increase the duration of luminescence. The shorter light waves augment the intensity of luminosity, the longer having the opposite effect.

Transpiration [in plants], R. C. KNIGHT (*Sci. Prog. [London], 13 (1919), No. 52, pp. 561–566*).—A review of findings and views resulting from recent study by various authors named is largely epitomized in the statement that external conditions, as represented by soil and atmosphere, as well as the internal conditions peculiar to the plant, exercise an important regulating influence on transpiration. It is recognized that the problem of water movement through the plant is extremely complex.

Weather conditions and plant development, G. P. BURNS (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 119–122*).—Numerous examples are claimed to show that averages extending over long periods for humidity, sunshine, wind, air temperature, etc., may conceal rather than explain the essential facts. It is held that in all study of the relation of weather conditions to plant development the importance of critical periods in the environment must be taken into consideration.

Contact stimulation, G. E. STONE (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 454–479, figs. 4*).—Presenting results of experimentation carried on since 1904 with several common plants, the author holds that contacts of plants or parts thereof with one another, with wires, and with other bodies result in a reaction or response which may be connected with electrical phenomena but which appears to be quite primitive and universal among plants, if not common to the lower forms of life in general. Leaves appear to be particularly sensitive. The nature of the reactions appears to be fundamentally similar to that of touch, from which it is thought such highly differentiated reactions as those of tendril and wound responses may have originated.

Apparatus for determining the temperature of leaves, E. B. SHREVE (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 80, 81*).—A description is given of an apparatus which may be used to find the surface temperature of leaves without injuring them, and which has been used with a large number of plants of different ecological types growing under very dissimilar conditions.

The results have not yet been sufficiently assembled to warrant definite conclusions. The most outstanding fact is the rapidity with which the surface temperature of a leaf growing in the open may fluctuate within a time of 20 to 60 seconds, often amounting to from 1 to 3° C., and in moderately strong winds changing as much as 5° in 30 seconds.

**Evolution by hybridization**, E. C. JEFFREY (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 298–305, pl. 1*).—This is a critical review of recent publications.

**Inheritance studies on castor beans**, O. E. WHITE (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 513–521, pls. 6*).—Hybridization studies involving several thousand plants have been pursued through the $F_1$, $F_2$, and in some cases, the $F_3$ generations derived from 50 or more types grown from seeds representing different growers. Very little cross-fertilization occurred. Details are given, with some interpretation of the data obtained, from the study on stem color, bloom, dehiscent and indehiscent pods, and seed coat color.

**The inheritance of doubleness in Chelidonium majus**, K. SAX (*Genetics, 3 (1918), No. 3, pp. 300–307*).—Presenting results of statistical studies of the relation of petals and stamens and of the inheritance of doubleness in *C. majus*, the author states that this quality appears to be a simple recessive character. There is apparently a continuous series in degree of doubling from singles to full doubles in the $F_2$. Much greater variation is noted in the doubles, which are recessive, than in the singles of which two-thirds are heterozygous. The $F_2$ doubles are no more variable than individual double plants of that generation. A high degree of negative correlation exists between petal number and stamen number in the $F_2$, due to petalody.

**Duplication and cohesion in the main axis in Cichorium intybus**, A. B. STOUT (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 480–485, pl. 1, fig. 1*).—The terms duplication and cohesion are here used to designate a very special type of fasciation, observed by the author to occur in a cultivated variety of chicory and made the subject of a study, the results of which are reported herein. In addition to a very decided duplication with cohesion of the main axis, other irregularities occur in the development of cotyledons and plumule, involving in some cases fusion or suppression.

The character of duplication and cohesion of the main axis is strongly but not completely heritable. In an $F_1$ hybrid generation of crosses between plants showing duplication and plants of wild stock free from these abnormalities, the duplication is incompletely dominant both as to degree of expression and number of plants affected. An intermediate type is noted in which the only indication of duplication is seen in a mixed and irregular phyllotaxy.

**Intercrosses between self-sterile plants**, E. M. EAST (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 141–153*).—Work done with *Nicotiana forgetiana* and *N. alata* and their intercrosses, part of the data from which have been published elsewhere (E. S. R., 38, p. 823), is considered to show unmistakably that the behavior of self-sterile plants in intercrosses is governed by a relatively small number of factors, which act through the pollen; also that the gametes of plants having like constitutions as regards effective factors are incompatible in the sense that they do not make a normal pollen tube growth and hence do not reach the ovary in time for fusion to occur.

This interpretation is considered to show why plants are both self-sterile and cross-sterile. It accords completely with the fact that a population of plants may be divided into groups on the basis of their mating proclivities, and that each member of any group is cross-sterile with every other individual of that group although fertile with every individual of every other group.

It is considered possible by continuous self-fertilization, utilizing end-season pseudofertility, to obtain ultimately a population in which every individual possesses the same effective self-sterility factors, all the plants in such a population being cross-sterile as well as self-sterile. It is claimed that such a population has in fact been obtained.

**An analysis of the changes involved in a case of progressive mutation,** C. D. La Rue and H. H. Bartlett (*Genetics, 3 (1918), No. 3, pp. 207–224, fig. 1*).—In continuation of a study (E. S. R., 37, p. 724) of mutations derived from *Œnothera reynoldsii*, the authors summarize by stating that in a series of mutations showing both reduction and increase in the size of the entire plant and its organs the size characters appear to involve only the number and arrangement of cells, and not at all the size of the cells, which remains the same throughout the whole series.

**Variations in the number of somatic chromosomes in Œnothera scintillans,** R. T. Hance (*Genetics, 3 (1918), No. 3, pp. 225–275, figs. 12*).—Having found that *Œ. scintillans* does not give constant chromosome counts in the somatic cells, the author carried out comprehensive studies with material collected from three generations, finding that the number varied from 15, the type or fundamental number, to 21, the additional numbers believed for reasons given to be produced by fragmentation of the type chromosomes. Fragmentation appeared to be confined to the longer chromosomes and was not observed to occur in the cells of the germinal line. Two classes of gametes were found, one possessing 7 chromosomes and the other 8. The data obtained are used as a basis for suggestions.

It is believed that the methods of procedure adopted in this study will be found applicable to a number of cytological problems.

**Further studies on the interrelationship of morphological and physiological characters in seedlings of Phaseolus,** J. A. Harris (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 167–174*).—The purpose of this paper is to supplement and extend the results of an earlier study (E. S. R., 36, p. 221), in which it was shown that in bean seedlings characterized by certain morphological variations from type the development of primordial leaf tissue is less than in normal controls grown under conditions as nearly as possible identical. The data then available indicated that a reduction of the volume of primordial leaf tissue is associated with abnormalities of all the types studied, but that the type of variation influences, in some degree, the amount of reduction.

While the first experiments gave results based upon primordial leaves only, this paper presents the results of the determination based upon the first trifoliate leaf, the material used being a mixture of slightly different strains of navy beans. Consideration of the data is held to justify the statement that a correlation exists between morphological and physiological variations in plants, seedlings of Phaseolus which show one of the smallest definite structural variations, that is, the slight vertical separation of the two cotyledons in their insertion on the axis, being differentiated from the structurally apparently normal individuals in their physiological and also in their morphological characteristics, producing in this case a smaller weight of dry substance in the leaf tissue and a smaller relative weight of dry substance in both primordial leaves and the first trifoliate leaf.

**Tubers within tubers of Solanum tuberosum,** F. C. Stewart (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 423–426, figs. 3*).—A case is described in which, in addition to the large numbers of new tubers formed on seed potatoes stored over summer in slatted crates in a cement cellar, a number of such new tubers formed within the old tubers, in some cases weighing from 25 to 60 gm. and in one case

67 gm. The dissection of one seed potato showed that the sprout bearing the new tuber had started from an eye where two external sessile new tubers were attached. Apparently the direction of growth had been inward from the beginning. The ingrowing sprouts showed the lenticel-like openings described by Gager (E. S. R., 26, p. 828) in an account of a case which the present case resembles in some respects.

## FIELD CROPS.

[Report of field crops work in Idaho, 1918], R. K. Bonnett, H. W. Hulbert, R. J. Leth, P. A. Wenger, P. P. Peterson, E. B. Hitchcock, and F. H. Lafrenz (*Idaho Sta. Bul. 113 (1918), pp. 22–24, 28–31, 43, 44*).—This describes the continuation of work previously noted (E. S. R., 39, p. 333). The moisture supply during the season of 1917–18 is said to have been insufficient for normal crop production. Observations on variety tests with cereals may be summarized as follows:

Turkey Red again gave the best results in tests of winter wheat varieties, while Kharkov and Red Russian also gave satisfactory results. Fall-sown Marquis wintered well and produced a good yield of excellent quality. Jenkins Club, Palouse Bluestem, Early Baart, and Marquis appeared to be the most promising spring wheats for this region. White Winter barley, with an average yield of 65.4 bu. per acre since 1911, has surpassed all other winter varieties and has also given good results as a spring variety. As a rule six-row types of barley have outyielded the two-row types, while the bearded varieties have outyielded the beardless sorts. Swedish Select, Banner, Danish Giant, Abundance, Colorado No. 37, and White Russian oats are deemed to be specially adapted to this section. Petkuser winter rye was first with a yield of more than 35 bu. per acre. The crop is also said to show much promise as an early spring pasture crop. Spring rye can not be recommended.

Cultural and variety tests with forage crops seeded alone and in mixtures are briefly noted. Alfalfa gave the best results when seeded in rows, as did also Sudan grass. Other legumes and grasses which gave promising results included red, alsike, and sweet clover, brome grass, orchard grass, tall meadow oat grass, perennial rye grass, Italian rye grass, and slender wheat grass. A few plants of an annual white sweet clover grown from seed secured from the Iowa Experiment Station (see p. 227) made an excellent growth and ripened some seed. It is stated, however, that this plant can not replace biennial white sweet clover in hay or pasture mixtures. A number of varieties of millet made fair yields, but were not so satisfactory as Sudan grass. None of the sorghum varieties tested produced seed, and only a few developed sufficiently to make a good quality of coarse hay. Ogemaw soy beans, an early sort, appeared to be best for northern Idaho. White Canada or White Colorado field peas are deemed best for seeding with oats for hay. Ear-to-row plantings of Rustler White Dent corn, said to be best for both grain and silage in the northern part of the State, yielded as high as 123 bu. per acre, while a number of rows produced at the rate of more than 90 bu.

A report of the seed analyst for the year ended December 1, 1918, prepared by P. A. Wenger, comprises a brief statement of the number of samples of different field crop seeds examined for purity and germination. A total of 1,291 samples were tested for purity and 198 for germination.

Wheat grown in rotation with and without manure on Palouse silt loam produced on the average 16.8 bu. per acre without manure and 19.2 bu. with manure.

Work on the Sandpoint substation showed that wheat grown on clover and timothy sod produced 12.6 bu. as compared with 8.5 bu. from plats otherwise

similarly treated. These results are held to indicate that newly broken forest land should first be seeded to clover or clover and timothy. Crop yields on the substation were as follows: Clover hay 2.5 tons (2 cuttings), Japanese and Silver-hull buckwheat 24.8 and 13.2 bu., respectively, Russett, Early Ohio, and Rural New Yorker potatoes 181, 160, and 148 stacks, respectively, Half Sugar and Danish Sludstrup mangels 57,080 and 52,200 lbs., Danish Ballhead cabbage 36,300 lbs., White Belgian stock carrot 24,500 lbs., and Danvers Half Long carrot 30,200 lbs. per acre.

[Report of field crops work on the Aberdeen substation, 1918], L. C. Aicher (*Idaho Sta. Bul. 113 (1918), pp. 34–37*).—The continuation of work along the same general lines as previously indicated (E. S. R., 39, p. 334) is described. It is stated that this was the driest season since the substation was established, the precipitation during the growing season being 3.37 in. as compared with an average of 4.16 in. Work on the dry land farm may be summarized as follows:

Alberta Red, Ghirka, and Theiss winter wheats produced average yields of 18.8, 18.6, and 18.1 bu. per acre, respectively, for the 6 years 1913 to 1918, while the yield of spring wheat varieties tested ranged from 6.6 bu. for Kubanka to 12 bu. for both Early Baart and Bluestem. Sixty-day oats produced 20.4 bu., and Smyrna and Beldi spring barleys 14.1 and 12.9 bu., respectively. The highest yield of flax, 7.8 bu. per acre was secured from C. I. No. 30.

Field peas grown in a variety test for the period of 1913 to 1918, inclusive, ranged in yield from 6.7 bu. per acre for Cossack and Bangalia to 8.1 bu. for both Grey Winter and McAdoo (formerly Kaiser).

The average yield of potatoes for 3 consecutive seasons ranged from 160.8 bu. per acre for Early Six Weeks to 224.5 bu. for Idaho Rural. Potatoes grown from seed produced on irrigated land yielded 8.9 bu. more per acre than those grown from seed produced on dry land. With yields ranging over 200 bu. per acre, however, this increase is deemed negligible and is held to indicate that the supposed superiority of irrigated seed potatoes does not exist.

Cultivating winter wheat or plowing under green manure did not prove profitable. Wheat grown on summer fallow produced 6.2 bu. per acre as compared with a general average of 4.4 bu. for the winter wheat plats. A rotation of wheat and field peas has given the best results of any rotation, but if continued without fallow is said to lead to reduced yields of both crops.

Results secured on the irrigated farm may be summarized as follows: Spring wheat yields ranged from 39.1 bu. per acre for Early Baart to 51.2 bu. for Dicklow for the period of 1913 to 1918. The yield of oats ranged from 106.1 bu. for Swedish Select to 115.1 for Golden Rain, and of barley from 73.1 bu. for Smyrna to 87.4 bu. for Trebi for the same period. Smyrna flax produced a 3-year average yield of 26.6 bu.

World Prize and Wellwood field peas are said to have given the highest yields in a 5-year test. The average yield for 19 varieties of field peas was 55 bu. per acre. Grimm alfalfa produced at the rate of 5 bu. of seed per acre, red clover 3 bu., and alsike clover 2.5 bu.

Idaho Rural, Green Mountain, and Irish Cobbler potatoes, with 5-year average yields of 400, 397.4, and 352.3 bu. per acre, respectively, were the leading varieties tested. No increase in yield has been secured in transposition tests.

[Report of field crops work in Iowa, 1918] (*Iowa Sta. Rpt. 1918, pp. 19–12, 24, 25, 26*).—This describes the progress of work along the same general lines as previously noted (E. S. R., 40, p. 328).

Forcing air, heated to a temperature of from 160 to 180° F. through cribbed corn reduced the moisture content from more than 30 to less than 10 per cent at an estimated cost of 3 cts. per bushel for fuel and power.

Iowa 103 and Iowa 105 oats continue to show a marked superiority over common varieties in cooperative tests throughout the State. An annual white sweet clover, said to have been isolated for the first time at Ames during the winter of 1915–16, when seeded in the field made a growth of 4.5 ft. within 3.5 months, as compared with a growth of only 4 in. for red clover, 9 in. for annual yellow sweet clover, and 14 in. for biennial white sweet clover all seeded at the same time and subjected to identical conditions.

Winter wheat seeded as late as November 21 survived with practically no winterkilling, this being attributed to the fact that the seed sprouted very little or not at all before winter conditions checked growth.

In germination tests of weed seeds buried in the soil in the fall of 1911, ten species germinated readily in April, 1918. Among these 30 per cent were jimson weed, 25 per cent burdock, 20 per cent Indian mallow or butterprint, and 18 per cent horse nettle. Weeds were found to transpire a large amount of water which should go to cultivated crops. Rape, wheat, and oats when properly planted crowded out quack grass.

Observations on a number of varieties and strains of oats grown in the nursery in an effort to secure sorts resistant to crown and black stem rust led to the discovery of Green Russian and White Russian, both resistant to stem rust, while the latter is also said to be quite resistant to crown rust.

**Variety testing and crop improvement**, C. S. KNIGHT (*Nevada Sta. Rpt. 1918, pp. 23–30, figs. 2*).—Variety tests with wheat, oats, barley, and forage and root crops are described in continuation of similar work previously noted (E. S. R., 39, p. 128).

The average yield of wheat varieties grown in 100-ft. rows for four years ranged from 2,720 lbs. of grain per acre for White Australian to 3,157 lbs. for Colorada No. 50. The superiority in quality of Marquis and Blue Stem, yielding 2,970 and 2,979 lbs. per acre, respectively, is said to more than offset the difference in yield between these varieties and the highest producing sorts. Of the oat varieties tested for three years Early Mountain No. 2 was first with an average yield of 2,843 lbs. per acre, and was affected less by the shattering of the seed, due to blasting of the panicles before ripening, than any of the other varieties tested. Barley yields ranged from 2,708 lbs. for White Moravian to 2,926 lbs. for California Feed for varieties grown four years, while Swedish Gold grown for two years produced on the average 4,821 lbs. The leading varieties of cereals tested in plats during 1916 and 1917, together with their respective yields per acre, were as follows: White Club wheat 2,641 lbs., Great Dakota oats 1,037 lbs., and Chevalier barley 2,135 lbs. In tests conducted in cooperation with the Truckee-Carson reclamation project experiment farm, Little Club, Marquis, and Sonora were found to be the highest yielding wheat varieties when compared with the local sorts, while Beldi barley outyielded the local variety.

The total yield of alfalfa for two cuttings ranged from 4.57 tons per acre for Grimm to 6.04 tons for Australia 23,753. The proportion of leaves to stems varied from about 34 to 40 per cent.

Improved Leaming corn produced 28,422 lbs. of silage as compared with 46,240 lbs. for Russian sunflower. The latter is said to have made silage superior in quality to that from corn. Sudan grass surpassed the millets and field peas both in forage and seed production. A yield of 8 tons per acre of excellent silage was secured in 1917. The average yield of seed for the past 3 years amounted to 1,218 lbs. per acre.

Great Divide, Burbank, and Peerless potatoes have produced maximum average yields for a 5-year period of 13,546, 12,991 and 11,782 lbs. per acre, respectively. Our Ideal mangel produced the highest average yield, 30,469 lbs. per acre, for a 4-year period in a comparative test of different varieties of beets, but is deemed inferior in feeding value to sugar beets which produced at the rate of 25,907 lbs. for a 3-year period. In date-of-planting tests with sugar beets the best results were secured from plantings made before the first of May.

[Report on the activities of the agricultural association of Zealand, Denmark, in 1918], A. P. Jacobsen (*Ber. Landbofor. Virks. Planteavl. Sjælland, 1918, pp. 551, pls. 3, figs. 2*).—The activities reported on included cooperative experiments with fertilizers and lime, rotations and fallows, variety tests of different field crops, examination and testing of seeds, studies of methods of weed destruction, and determination of the nitrogen content of fertilizers. The report presents also the proceedings of the meetings of the association, together with a discussion of the association's work in general. The conditions affecting agriculture during the year are briefly noted.

In fertilizer experiments conducted with cereal crops from 100 to 200 kg. of nitrate of soda per hectare (about 89 to 178 lbs. per acre) were used, alone or in combination with 150 to 300 kg. of superphosphate or with this amount together with 100 to 150 kg. of 37 per cent potash salt. It is calculated that to defray the cost of the fertilizers 100 kg. of nitrate of soda had to produce an increase in yield of 160 kg. of grain and 1,600 kg. each of roots and grass; 100 kg. of 18 per cent superphosphate, 100 kg. of grain and 1,000 kg. each of roots and grass; and 100 kg. of 37 per cent potash salt, 72 kg. of grain and 720 kg. each of roots and grass.

A series of experiments was conducted with rye, barley, oats, and root crops on clay soils. The average results of five experiments with barley after another grain crop indicated an increase of 207 kg. of grain and 282 kg. of straw from the use of 100 kg. of nitrate of soda, and the unprofitable use of an addition of 100 kg. of superphosphate or of 100 kg. each of superphosphate and potash salt. The average results of 12 similar experiments with barley following root crops showed an increase of only 142 kg. of grain and 308 kg. of straw from the use of 100 kg. of nitrate of soda per hectare, and also an unprofitable use of either superphosphate or superphosphate and potash salt in addition. The plants receiving no fertilizers and on which barley was grown after another grain crop produced in 1918 an average of 2,088 kg. of grain and 2,426 kg. of straw per hectare, as compared with 2,469 kg. of grain and 2,884 kg. of straw, where the barley followed root crops.

The use of 100 kg. of nitrate of soda in growing oats gave a profitable increase only where the oats followed grass.

The average results of 21 experiments with mangels following different crops showed an increase of 3,200 kg. where 100 kg. of nitrate of soda had been applied. The addition of 100 kg. of superphosphate was profitable in only nine of the experiments, and the average results were also unsatisfactory. The application of 100 kg. of potash salt together with superphosphate gave, on the average, profitable returns. The results from the use of superphosphate and potash salt varied to a marked extent.

In a limited number of fertilizer experiments with grass grown for seed, it was found that nitrate of soda and potash salt applied to land in Italian rye grass gave satisfactory average increases in yield.

For three years nitrate of soda at the rate of 100 kg. per hectare was used alone and in combination with a complete application, including a like amount in growing barley and oats. In 1918 a large increase in yield was secured

from the nitrate used with the complete application, but in the two preceding years a single application appeared the more profitable. A similar experiment with corresponding results was conducted with mangels, but in this case 150 kg. of the nitrate were used.

A comparison of Norwegian nitrate, ammonium nitrate, ammonium sulphate, and lime nitrogen of German, Swedish, and Norwegian manufacture was begun in 1914 and completed in 1918. Swedish turnips and orchard grass responded in general quite favorably to the use of the different substances, while sugar beets and mangels responded very unfavorably, and oats, barley, and potatoes gave intermediate results. In discussing these data the belief is expressed that the sodium of the nitrate of soda may have acted injuriously upon the Swedish turnips and the orchard grass and favorably upon the sugar beets and mangels, while it remained neutral with reference to oats, barley, and potatoes.

Experiments conducted for one year with superphosphate and Bornholm raw phosphate used on different crops indicated that the raw phosphate had produced from 50 to 80 per cent of the effect of the superphosphate on the basis of the phosphoric acid content of the two substances. The raw phosphate was most effective on lime-poor soils.

In variety tests with different crops the following were the leading sorts: Tystofte Small wheat II, Tystofte Prentice 2-rowed barley, Svalof Victory oats, and Up-to-date and Richter Imperator potatoes.

Of different methods tried for control of thistles deep plowing late in the fall and subsoiling gave the best results.

In connection with a rotation experiment in 1916, certain plats were in fallow while others were devoted to 6-rowed barley, soiling crops, potatoes, or turnips. In the fall of that year the entire series was sown to wheat and rye, the wheat receiving barnyard manure and the rye superphosphate. In the spring of 1917 one-half of each plat was given 100 kg. and the other 250 kg. of nitrate of soda per hectare. Cropping as compared with fallowing apparently reduced the yields of wheat and rye to a marked extent, the greatest reduction being after 6-rowed barley and the smallest after potatoes or turnips. A comparison of the total production for the two years with the plats in fallow showed the following average increase in the production of feed units per hectare where the smallest quantity of nitrate of soda was applied; 6-rowed barley plats 2,480, soiling crop plats 2,510, and potato plats 4,331. On the plats receiving 250 kg. of nitrate of soda the corresponding increases were 2,671, 2,669, and 4,407 feed units, respectively. In another similar experiment, the largest increase in production of feed units per hectare was also in favor of the plats which had produced the root crops.

Culture experiments conducted with wheat crops showed that plantings made April 10 gave better yields than plantings made April 23. Mangels thinned at the proper time gave a yield 3,800 kg. greater than that secured from a plat 11 days later, and plants thinned to 24 cm. apart in the row gave a yield greater by 800 kg. per hectare than the yield from plants thinned to 30 cm. apart as compared with greater distances between plants and later planting. Chicory produced the best yield when set about 4 in. apart in the row on April 28. Turnips grown for seed and not thinned did not produce as large a yield as when derived from those thinned to 6 in. apart in the row. Cutting back Swedish turnips to two-thirds their actual size about June 1 caused a marked reduction in yield. Covering the rows on February 12 with seaweed at the rate of 20 loads per tŏndeland (1.36 acres) increased the yield by about one-third.

Tests with different grass and clover mixtures resulted in the best yields, even the first year, from a seed mixture of 6 kg. of red clover and 16 kg. of

alfalfa per hectare sown on good soil. On lime-poor soil, mixtures containing a large proportion of bird's foot clover (*Lotus corniculatus*) succeeded best. The results from drilling and broadcasting the seed mixtures differed but little.

Cultural experiments were conducted also with oil and fiber plants. Yellow mustard produced the best yield where sown at the rate of 4 kg. per hectare. In another test drilling in rows 16 cm. apart gave the best results. Russian sunflowers compared with two other varieties led in yield with about 2,500 kg. of seed per hectare. Planting the sunflower seed April 17 proved best. The yield was only slightly larger than that from a planting made May 1, but planting May 18 was found too late for good results. Brief directions for harvesting sunflower seed are given. The highest yield and quality of flax seed and fiber were obtained from sowing April 25. Hemp sown April 30 gave a higher yield than that sown May 14.

[Work in 1917 at the experiment stations at Leteensuo and in Syd-Osterbotten], E. A. Malm (*Finska Mosskulturför. Årsbok, 22 (1918), No. 1, pp. 12–19*).—At Leteensuo, the yields of hay on meadows drained by ditches of different depths were in favor of the depth of 0.5 meter (19.18 in.) as compared with 0.75 meter and 1 meter depths. The ditches were dug 10, 20, and 30 meters apart and where the distances were 10 and 20 meters the yields were about equal. The smallest yields were secured where the ditches were 30 meters apart.

The effect of sand and clay applied to bog soils was studied. Applications of clay and sand were made at the rates of 100, 200, 300, and 400 cubic meters per hectare. The increase in yields was greater where the clay had been used than where the sand was applied. However, an application of 100 kg. of phosphoric acid or of this amount with 100 kg. of potash per hectare produced increases in yield very much greater than those secured from the use of either sand or clay alone. The highest yield of hay, 6,240 kg. per hectare on the soil treated with sand, was obtained where 300 cubic meters of sand and phosphoric acid and potash had been given, while on the soil treated with clay the best return, 7,096 kg. of hay per hectare, was obtained where only 100 cubic meters of clay were applied with the phosphoric acid and potash.

It is pointed out in this connection that some years ago Swedish turnips were grown on a series of plats treated with clay in the manner described and receiving also 200 kg. of bone meal and 300 kg. of kainit per hectare. The best yield, 28,900 kg. per hectare was secured from the treatment of 300 cubic meters of clay and the least, 15,100 kg. per hectare, where no clay had been given. The plat treated with 400 cubic meters produced 26,800 kg. of turnips per hectare, standing next to the highest yield.

The results of experiments in applying lime at different rates on bog lands treated with sand and clay were not conclusive. Only in one instance, where 3,000 kg. of lime per hectare were applied in 1907 and again in 1913, and where during the particular crop season 200 kg. of bone meal and 300 kg. of kainit or 230 kg. of ammonium sulphate in addition to this application were used per hectare, did lime appear to increase the yield of hay, the increase being 932 and 2,225 kg. per hectare for the two applications, respectively.

In a comparison of Thomas slag and so-called Bernard phosphate as fertilizers for oats, the best yields of grain and straw were obtained with the Thomas slag. The two fertilizers were applied with 500 kg. of kainit at the rate of 40 and 80 kg. per hectare. In a test of superphosphate and the so-called diphosphate on land not treated with either sand or clay, it was found that the results were slightly in favor of the diphosphate. In a third ex-

periment on land treated with clay, 150 or 200 kg. of nitrate of soda and 115 kg. or 230 kg. of sulphate of ammonia per hectare, given in addition to 200 kg. each of bone meal and kainit, increased the yields, the better results being from the larger quantities applied. It was found in this experiment also that on limed soil the increases in yield due to these fertilizers were much greater than those on unlimed soil.

Fertilizer experiments conducted at the experiment station in Syd-Österbotten showed that on bog soil treated with clay and given 150 kg. of bone meal per hectare the use of 2,000 kg. of lime per hectare resulted in a marked increase in the yield of hay. The best yield was 4,776 kg. per hectare, as compared with 1,160 kg. where the soil had been treated with 300 cubic meters of clay per hectare.

A study was made also at this station of the effect of either oats or leguminous crops or different mixtures of the same on a succeeding crop of turnips. The crop mixtures varied by 20 per cent of each other as to the proportion of oats and legumes. Yields of turnips were increased from 15,100 kg. per hectare where the crop followed oats to 33,127 kg. where it followed a leguminous crop. The turnip crop following the mixtures increased in about the proportion the leguminous crops increased and the oats decreased in the crop mixture.

[Irrigation experiment with alfalfa and wheat], C. S. Knight (*Nevada Sta. Rpt. 1918, pp. 19–23*).—This describes further progress of work previously noted (E. S. R., 39, p. 132).

From results secured during the period of 1915–1917, inclusive, it was concluded that the most economical method of irrigating alfalfa in Nevada is to make 12-in. applications of water when the leaves turn dark-green in color and begin to droop. Under these conditions an average yield of 5.18 tons per acre was secured with 36 in. of water. The maximum yield, 6.63 tons, was secured with a total of 80 in. of water made in 12 in. applications before the plants showed need of water.

In the wheat experiments, the highest yield per acre and per acre-foot of water for the period of 1914–1917, inclusive, was obtained with four 7-in. applications, the irrigation at the five-leaf stage being omitted. The lowest yield per acre-foot of water applied followed five 7-in. applications. The lowest yields with both 3- and 7-in. applications followed the omission of irrigations at the boot and bloom stages, respectively. Omitting irrigation at two stages of growth, the maximum yield, 32.4 bu. per acre, was obtained with 21 in. of water made in three 7-in. applications, omitting the five-leaf and dough stages. With both 3- and 7-in. applications the most critical period in the irrigation of wheat was found to be between the boot and milk stages. Where only two irrigations were made the largest yield, 31 bu., was secured from 9-in. applications, one before and one after heading. An application of only 12 in. made in two irrigations produced the highest yield per acre-foot of water, 27.4 bu., as compared with 14.1 bu. for 24 in. of water, and 20.7 bu. for 18 in. The average annual precipitation for the four years of the experiment was 7.52 in.

See also previous notes (E. S. R., 39, pp. 338, 343).

Clover and grass seeding in the conversion of waste land into meadow, A. Grisch (*Landw. Jahrb. Schweiz, 32 (1918), No. 4, pp. 505–524, figs. 3*).—Field tests conducted during 1912–1915, inclusive, are described in which observations were made upon the effect of seeding poorly drained waste lands with a mixture of 14 different sorts of clovers and grasses, and of applications of superphosphate, Thomas meal, and potash in various combinations. It is concluded that by harrowing, seeding with a suitable clover and grass mixture, and apply-

ing appropriate fertilizers poorly drained land may be converted into profitable hay land within a comparatively short time and with a small outlay of money and labor, either as a permanent improvement or as a step toward the further development of the area for growing cultivated crops.

**Brown hay**, W. A. LINKLATER (*Washington Sta., West Wash. Sta. Mo. Bul., 7 (1919), No. 3, pp. 38, 39*).—The preparation of so-called brown hay, in western Washington, under weather conditions adverse to the proper curing of ordinary hay, is briefly described. The material is cut about the time of heading out in June and cured until in prime condition for cocking, when it is placed in a stack, either in the barn or outside and firmly packed. The stack is said to heat considerably, the curing process continuing from 30 to 60 days. The hay is described as dark brown or black in color, nutritious, and palatable.

**Cassava experiments, 1916–1918**, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 17 (1918), No. 4, pp. 193–198*).—Variety, cultural, and fertilizer tests with cassava are described in continuation of work previously noted (E. S. R., 38, p. 530).

Yields of roots ranging from 5.53 to 8.59 tons per acre for Maman l'Enfant and Sellier, respectively, were secured in the variety tests. Level cultivation with the plants spaced 3 by 3 ft. continued to give the best results. Sellier planted the latter part of April and harvested 17 months later produced 10.77 tons of roots containing 15.26 per cent starch, as compared with 1.42 tons of roots and 12.35 per cent of starch from a planting made the latter part of March and harvested 6 months later. Plantings of the same variety made about the middle of April and harvested from 6 to 17 months later showed a range in yield of from 2.02 to 8.88 tons of roots per acre, respectively. The percentage of starch in the roots appeared to be little affected by the age of the plant eight months after planting, increasing from 7.86 per cent for roots harvested at 6 months of age to 22.03 per cent for those harvested when 8 months old. The maximum percentage of starch, 27.62, was attained in roots harvested 11 months after planting, but the yield of roots was only 6.4 tons. The maximum yield of starch, 4,708 lbs. per acre, was secured from roots 14 months of age.

Applications of pen manure at the rate of 20 tons per acre and of a complete fertilizer at the rate of 300 lbs. per acre resulted in average yields of 13.45 and 10.96 tons of roots per acre, respectively, as compared with 4.85 tons from the checks. The low yields of the latter are thought to be due to shading by the fertilized plats.

An attempt to develop improved strains of cassava from seed in 1916 resulted in six seedlings which gave sufficient promise to justify their further propagation by cuttings. The yields secured from single plants at about 19 months of age ranged from 4.75 to 25 lbs., representing yields of from 10.26 to 54 tons per acre from plants spaced 3 by 3 ft.

**How to increase Indiana corn yields**, A. T. WIANCKO (*Indiana Sta. Circ. 91 (1919), pp. 20, figs. 10*).—Stating that the area devoted to corn in Indiana should be reduced and that the average yield could be materially increased, the author maintains that more attention to seed selection, crop rotation, and soil fertility will produce the desired results. The selection, storage, and testing of seed corn, the place of the crop in the rotation and the maintenance of soil fertility, field practices and cultural methods employed in growing the crop, and insect pests and diseases affecting corn in Indiana are discussed in a general manner.

**Comparison of yield of Minnesota No. 13 corn from seed grown under different conditions**, E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1919), No. 1, pp. 5, 6*).—Cooperative tests with Minnesota No. 13 corn, said

to have given the best results in variety tests at the Puyallup substation for the past six years, are described in which seed grown at Prosser, Wash., under irrigation, and at Dufur, Oreg., a mid-mountain district, was compared with that grown at Puyallup for five years. It is concluded that seed corn produced just north of the forty-fifth parallel in South Dakota, Minnesota, or Wisconsin merits extensive trial, while that from regions having a long, hot growing season is not deemed suitable for western Washington conditions.

**Present position and future prospects of the natural indigo industry**, W. A. Davis (*Agr. Jour. India, 13 (1918), Nos. 1, pp. 32–46, pl. 1; 2, pp. 206–221, pls. 3; 3, pp. 441–459; 14 (1919), No. 1, pp. 21–41; Agr. Research Inst. Pusa Indigo Pub., 1918, Nos. 2, pp. 18; 4, pp. 19; abs. in Nature [London], 101 (1918), No. 2528, p. 116; 102 (1918), No. 2550, pp. 27, 28*).—This comprises a comprehensive account of the natural indigo industry; the possibilities of cheapening the production and improving the quality of natural indigo; the position of synthetic indigo production before the war and the effect of the war upon the production of natural indigo, especially in India; the present methods of manufacture in Bihar; and the future of natural indigo in India, with particular reference to maintaining the yield and quality of the crop through the use of superphosphates.

**Experiments with potatoes** (*Tidsskr. Norske Landbr., 25 (1918), No. 9, pp. 351–366*).—Potatoes were grown for five years, 1913–1917, in rows 55, 63, and 73 cm. (21.5, 24.6, and 28.5 in.) apart. The average starch content for the five crops was 16.1, 16.2, and 16.3 per cent for the close, medium, and wide planting, respectively. The difference in yield of tubers was insufficient to offset the greater value of the seed tubers required for the close planting, so that planting at the medium distance was slightly more profitable.

For the same period broadcasting the fertilizer was compared with applying it in the furrow. The larger yield of potatoes, together with a slightly higher percentage of large tubers, was secured from the applications made in the furrow, but the method of applying the fertilizer apparently had no influence on the starch content.

Other results indicated that the starch content and the total yield of starch may increase very perceptibly during the period beginning about August 20. The yield of tubers in these experiments continued to increase up to the close of September, even if the stems died down somewhat earlier, but later a decline in yield was notable, especially on dry soil. The starch content of the tubers increased up to the death of stems and foliage, after which it declined somewhat, and the absolute starch production behaved in a similar manner.

**An analysis of the costs of growing potatoes**, D. S. Fox (*New York Cornell Sta. Mem. 22 (1919), pp. 525–627, figs. 27*).—Extensive studies planned to secure more definite and accurate knowledge of the cost of growing potatoes and of the factors influencing their profitable production in New York are described and the results fully discussed. The information was secured by both the survey and cost-accounting methods. Surveys were made on 355 farms in Steuben County during 1912, 300 farms in Clinton and Franklin Counties during 1913 (data furnished by W. M. Peacock), 161 farms in Suffolk County during 1912, and 41 farms in Nassau County during 1912. Cost-accounting records made in cooperation with the Office of Farm Management, U. S. Department of Agriculture, during 1913, 1914, and 1915, included 26 crops on 20 farms located in the central and western parts of the State. The relation of numerous factors to production, cost of production, and profit in Steuben County and in Suffolk and Nassau Counties is also discussed in some detail. A suggested form of survey blank for cost of production work with potatoes is included.

The average cost per acre of growing and marketing potatoes for the different areas was found to be as follows: In Steuben County $51.13 or 42 cts. per bushel, in Clinton and Franklin Counties $67.43 or 38 cts. per bushel, on 20 cost-account farms $52.78 (exclusive of marketing charges), in Suffolk County $85.52 or 54 cts. per bushel, and in Nassau County $113.51 or 61 cts. per bushel. The amount of seed employed ranged from 10.2 bu. per acre in Steuben County to 14.7 bu. on the cost-account farms. The up-State farms used more manure than the Long Island farms, this being attributed to the fact that more was produced on the former and because its use tended to produce scab in Suffolk and Nassau Counties. Much more commercial fertilizer, insecticides, and Bordeaux were used on the Long Island farms, however, than in the up-State areas. The principal difference in the cost of producing potatoes on Long Island and up-State farms is said to be due to the use of better seed, more fertilizer, and higher land rentals on Long Island.

**Sudan grass as an Ohio crop**, C. G. Williams (*Mo. Bul. Ohio Sta., 4 (1919), No. 5, pp. 139–142*).—The production and utilization of the crop in the State is briefly described and the principal competing crops indicated.

In rate-of-seeding tests covering a 3-year period the yields of hay ranged from 2.74 tons per acre for a seeding rate of 7.5 lbs. drilled in rows 32 in. apart to 3.12 tons for a seeding rate of 30 lbs. drilled in rows 8 in. apart, while the most profitable rate was found to be 15 lbs. per acre drilled in rows 8 in. apart, resulting in an average yield of 2.96 tons. When grown for seed it is suggested that from 4 to 6 lbs. of seed be used in rows from 30 to 36 in. apart. The yields of seed are said to range from 10 to 30 bu. per acre.

A comparison of Sudan grass with its principal competitors, German millet and Early Amber sorghum, for a 7-year period resulted in average yields of air-dry forage amounting to 3.7, 3.7, and 8.3 tons per acre, respectively. The cost of seeding these crops at the most profitable rate based on present seed prices is estimated to be $0.875 per acre for Early Amber sorghum, $2.80 for German millet, and $3.80 for Sudan grass.

**A study of sugar cane experiments**, W. E. Cross (*Estudios Relacionados con la Experimentación de la caña de azúcar. Buenos Aires: Tucumán, Dept. Invest. Indus., 1918, pp. 109, figs. 33*).—This publication comprises a series of six conferences held with the agricultural alumni at the University of Tucumán, Argentina, for the purpose of discussing problems relating to sugar cane production and describing the experimental methods employed in their solution. The points considered included varieties, methods of planting, cultivation, fertilization, rotation and soil improvement, and moisture conservation, drainage, and irrigation.

**Experiments on the time of sowing turnips and rutabagas** (*Tidsskr. Norske Landbr., 25 (1918), No. 9, pp. 367–374*).—These experiments were conducted with Dale Hybrid turnip and Bangholm rutabagas for five seasons from 1912 to 1917, exclusive of 1915, when insects destroyed the crop. Comparative tests were made of crops sown on the 10th, 20th, and 30th of May each year, and the yields of roots, leaves, and dry matter by years are given in tables.

In general the yields decreased with the lateness of sowing, the only exception being the results of 1914, when on account of a dry season the largest yield of turnips was secured from the latest sowing. The dry matter content seemed to be influenced but little by the time of planting, but was determined by the yield of roots. There was a difference in the yield of dry matter of over 1,200 kg. per hectare (1,068 lbs. per acre) between the first and second dates of sowing rutabagas, and of nearly 1,400 kg. per hectare between the second and third dates. It is pointed out that a unit of dry matter in root crops has

the feeding value of a unit of barley, and that on this basis a difference of 10 days in sowing caused a reduction in the yield of dry matter corresponding to the value of nearly half of a medium yield of barley. The average yield of roots was also in favor of the earlier plantings.

The production of stems, and foliage as compared with the yield of roots was much less affected by the time of planting. Both crops produced the largest quantity of stems and leaves from the plantings made May 30.

**The heredity of quantitative characters in wheat**, G. F. FREEMAN (*Genetics, 4 (1919), No. 1, pp. 1–93*).—This paper is the first of a series of contributions to the knowledge of the inheritance of quantitative characters in wheat crosses made at the Arizona Experiment Station. The work was begun in 1913 by making a number of reciprocal crosses between an Algerian white macaroni wheat, Algerian red bread wheat, Early Baart, and Sonora. The present paper deals with the date of appearance of the first head on each plant, the total height of the plants measured in centimeters from the ground to the top of the tallest head, not including beards, and the width of the broadest leaf. The data secured for the parental strains and the $F_1$, $F_2$, and $F_3$ generations are presented in tabular form, together with their statistical analysis, fully discussed and summarized in detail for each character.

In a general summing up the author states that "the $F_1$ of the macaroni-bread wheat crosses developed normally and were in every case equal or superior to the mean of the parents in vegetative vigor, and they were no more variable in size characters or time of maturity than were the pure races. We may, therefore, conclude that a single complete set of macaroni wheat characters with a complete single set of bread wheat characters (the maximum of heterozygosis between the two varieties) will produce a perfectly normal plant. In the second generation, on the other hand, many of the seeds would not germinate and those germinating produced plants differing in vegetative growth from those which were more vigorous than either parent to such as never got beyond the rosette stage. Moreover, those which made a normal vegetative development exhibited every degree of sterility from completely sterile plants to those entirely normal in seed production. It would appear, therefore, that these facts alone refute any idea of blending inheritance, for if blending had taken place in the $F_1$, sterile or vegetatively deficient plants would be no more likely to occur in the $F_2$ than in the $F_1$. Hence we are compelled to predicate segregation and recombination in these quantitative characters. There is nothing to indicate even partial blending in any of the factors concerned.

"In the use of the coefficient of variation as an indication of heterozygosity in hybrids involving quantitative characters, care should be exercised to make due allowance for the fact that races with high means resulting from increased vegetative growth have their variability limited or reduced by the apparent law that size factors are more effective in producing variability in combinations tending to produce a result below the mean of the hybrid population than in combinations which tend to exceed this mean. The suppression of variability in cultures with high means applies to pure as well as hybrid cultures. It appears to be a telescoping of variability as the mean approaches the upper physiological limit of growth rate for the species concerned."

**Seed Reporter** (*U. S. Dept. Agr., Seed Rptr., 2 (1919), No. 12, pp. 8, figs. 6*).—Information is presented concerning vegetable seed crop conditions in California and the North Pacific division, the Kentucky blue grass and orchard grass seed outlook, seed dealers' receipts of leading forage crop seeds, wholesale and retail selling prices of 21 kinds of field seeds on May 28, 1919, and on market conditions in different sections of the country, together with statistics relating to

the number of growers of various classes of field seeds who follow certain practices in testing, cleaning, and marketing their seed. Tentative seed production and consumption maps are presented showing the counties in the United States reported as normally producing either a surplus, a sufficient, or an insufficient quantity compared with their planting requirements of seed of redtop, Kentucky blue grass, orchard grass, Canada field peas, cowpeas, and soy beans.

The establishment in England of the National Institute of Agricultural Botany for the increase and dissemination of improved strains of field and garden crops is briefly noted.

The usual statistics regarding imports of forage plant seeds permitted entry into the United States are included.

**Pure seed law and the weed control act,** P. WENGER (*Idaho Sta. Circ. 8 (1919), pp. 12*).—The text of both the pure seed law and the weed control act is presented and briefly discussed, together with rulings pertaining to seed inspection and analysis.

## HORTICULTURE.

**The book of the home garden,** E. L. FULLERTON (*New York and London: D. Appleton & Co., 1919, pp. XX+260, figs. 77*).—A popular treatise on the culture of vegetables, fruits, and flowers in the home garden.

**Vegetables and their cultivation,** T. W. SANDERS (*London: W. H. & L. Collingridge, 1917, 4. ed., pp. XV+496, pls. 13, figs. 150*).—A guide to the history, cultivation, and forcing of culinary vegetables, salad crops, and herbs for home use and exhibition; also the formation of the vegetable garden; the management of soils; manures and their uses; the eradication of injurious insect and fungoid pests; etc.

**A handbook of vegetable culture,** W. MOLEGODE (*Colombo, Ceylon: Times of Ceylon Co., Ltd., 1918, 2. ed., rev. and enl., pp. IX+124*).—Specific directions are given for the culture of various vegetables adapted to Ceylon, including general instructions on vegetable growing.

**Bud variation as a practical asset in horticulture,** M. J. DORSEY (*Minn. Hort., 46 (1918), No. 8, pp. 304–311, figs. 2*).—A contribution from the Minnesota Experiment Station, discussing the types of variations which occur in horticultural plants, the extent to which these types occur, the use that has been made of them in horticultural practice, and the influence of selection in horticultural varieties.

A review of the literature shows that bud variation may affect such important commercial fruit characters as color, season, size, growth, habit, and yield. These variations, however, have not been much of a factor in the origin of new varieties in the apple, cherry, plum, or grape, but have been in ornamentals and flowers. The work of bud selection by Shamel and others with citrus (E. S. R., 38, p. 541) has been more successful than with other fruits. The author concludes that the question of selection in the navel orange resolves itself down to a basis of working with differences that are constantly arising within the variety. When such differences arise within the varieties of any other fruit bud, selection has an importance other than that of developing new varieties for, "if by selecting automatically from the better types we are not selecting from the poorer types, then the procedure acts to hold the type stable."

**The effect of the frosts of the winter of 1916–17 on vegetation.** E. A. BOWLES (*Jour. Roy. Hort. Soc., 43 (1919), No. 2–3, pp. 388–461*).—A report on this subject to the Royal Horticultural Society, based on evidence received from important gardens in different parts of Great Britain. The general conditions

during the winter of 1916–17 are reviewed, minimum temperatures where available are recorded, and an alphabetical list is given of trees, shrubs, and other plants, showing the extent of damage, or escape from injury, as well as the number of years the plant has been grown in its present position.

**California crop distribution and estimates 1918** (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 4, pp. 127–225, figs. 38*).—This number of the bulletin deals with the acreage, distribution, tonnage, and valuation of commercial fruit and vegetable crops in California.

**Analyses of insecticides and fungicides** (*New York State Sta. Bul. 454 (1918), pp. 15*).—This comprises analyses of materials sold as insecticides and fungicides in the State of New York.

**[Beets and peas at Wisley]** (*Jour. Roy. Hort. Soc., 43 (1919), No. 2–3, pp. 488–520*).—Descriptions are given of varieties of beets and peas tested at Wisley, 1916–1918, including selected lists of meritorious varieties.

**Cabbage culture, J. W. Rigney** (*New Mexico Sta. Bul. 118 (1919), pp. 25, figs. 8*).—A practical treatise on the culture, harvesting, and marketing of cabbage, including some data on cultural and varietal experiments conducted at the station.

**General arboriculture, J. M. Priego** (*Arboricultura General. Madrid: M. G. Hernández Sons, 1917, pp. VI+393, figs. 131*).—A treatise on arboriculture, with special reference to Spanish conditions. Part 1 discusses the general principles of arboriculture, including methods of propagation and nursery practices. Part 2 comprises a treatise on fruit growing, harvesting, and marketing.

**[Report on horticultural investigations]** (*Iowa Sta. Rpt. 1918, pp. 32–36*).—A progress report on various projects for the year.

As a result of spraying experiments with fruit trees conducted for several years the following definite recommendations as to schedule of spraying best adapted to meet Iowa conditions are offered: Use lime-sulphur or Bordeaux mixture combined with arsenicals before the blooming season; use lime-sulphur with arsenicals between the blooming season and late June; use Bordeaux mixture with arsenical mixture after June. In orchards where there has been a high percentage of wormy fruit and in seasons when the worms are unusually abundant, it is advisable to spray twice for the second brood of codling moth, once during the last third of July and again after two or three weeks. In 1918 the brown rot of plums was kept under control at the State Fruit Breeding Farm by the use of Bordeaux mixture, 4:4:50, applied the middle of July, and repeating the applications two weeks before ripening season.

The long-continued experiments in the use of hardy and disease-resistant varieties as stocks on which to top graft some of the less hardy commercial apples thus far indicates the value of Wealthy and Virginia Crab as stocks for Jonathan, and of Virginia Crab and Delicious as stocks for Grimes. It has also been found that Delicious, when top-worked on Virginia Crab, comes into bearing earlier and gives a more satisfactory yield than on its own stock.

In the soil management experiments started in 1910 in an unproductive orchard of bearing age at Council Bluffs, various systems of tillage, cover crops, and management have been followed. Thus far the indications are against the practice of continuous clean cultivation, although it appears that certain methods of cultivation have their place in the management of a bearing orchard, as opposed to a continuous sod-bound condition. Under continuous clean cultivation, the loss of trees from winter injury is noticeably greater than where the land is kept in blue grass sod or legume crops. This injury has been greatest with Ben Davis and least with Grimes, Jonathan, and Roman Stem, in the order named. Northwest Greenings, Wealthy, and Oldenburg have escaped injury thus far.

Experiments covering several years have demonstrated that the canker on limbs and trunks of apple trees of bearing age, which is known as Illinois blister canker and is prevalent in orchards in western and southwestern Iowa, may be checked by chiseling out the infected wood and painting the entire wound with an antiseptic paint. Experiments dealing with the prevention of crown gall of nursery stock are yielding promising results although no definite methods of treatment are recommended at this time.

[Report on horticultural investigations], N. E. HANSEN (*South Dakota Sta. Rpt. 1918, pp. 22–24*).—Work in the breeding and selection of hardy fruits was continued (E. S. R., 39, p. 346). The Tecumseh, a fine extra large plum of Shiro×Surprise pedigree was sent out for the first time. Eight seedling apples on Siberian Crab stock were sent out for trial because they appear promising after three years of very severe invasion from blight. The quality of the fruit is unknown.

In the work of breeding blight-resistant pears Japan pear seedlings have not been successful as stocks, since they winterkill. After extensive test two species of Siberian pear (*Pyrus ussuricnsis* and *P. ovoidca*) appear to be resistant both to the blight and the rigorous climate of the Northwest. Seedlings of these species are to be used as stocks. A number of hybrids of *P. ovoidca* with the standard cultivated pear (*P. communis*) of western Europe have already been bred and distributed.

**Fruit growing in the semiarid Northwest**, M. PFAENDER (*Minn. Hort., 47 (1919), No. 5, pp. 194–202, figs. 3*).—A paper with discussion following, in which the author briefly notes the results secured with various orchard and small fruits at the Northern Great Plains Field Station, Mandan, N. Dak., and elsewhere in the Northern Great Plains area, and describes experimental methods of growing fruit trees being tested at the station.

**The Australian fruit industry.—Its development and importance**, W. J. ALLEN (*Fruit World Austral., 20 (1919), No. 4, pp. 80–83*).—A report on the extent and value of the fruit industry in Australia, including suggestions relative to organization, standardization, and cooperation.

**The Lorette system of pruning**, H. E. DURHAM (*Jour. Roy. Hort. Soc., 43 (1919), No. 2–3, pp. 261–277, pls. 4, fig. 1*).—The author describes a "spring-summer-autumn" method of pruning and training fruit trees employed by L. Lorette, chief of practical horticulture at the Wagnonville school near Douai, France, which has for its set purpose stimulation of growth in certain dormant eyes, whose productions are apt to possess fruit-bearing proclivities. A note on the nomenclature of fruit-tree parts, together with a bibliography of related literature, is appended.

**The healing of pruning wounds**, W. G. BRIERLEY (*Minn. Hort., 47 (1919), No. 4, pp. 145–152, figs. 7*).—An extensive study was made of pruning wounds on apple trees in the Minnesota Experiment Station orchards and in several other orchards, including young and old trees as well as neglected and well-kept trees. Data are given showing the relation of size and treatment of wounds to healing and the causes of failure to heal in well-made wounds.

The results of the study show that there is very little variation in the percentage of wounds healing on a basis of size of wounds, although larger wounds heal more slowly. The rate of wound healing was directly proportionate to the vigor of the tree. For all wounds examined, a general average of 93.7 per cent were healing. Of the wounds not healing, poor pruning accounted for the failure of nearly 9 out of every 10. Out of 2,256 well-made wounds, only 17 failed to start healing. These failed chiefly from fire blight infection. Previous decay in wood and drying back of the bark caused a few failures.

A comparative study of protected and unprotected wounds indicated that protection with wax or paint is of little value unless the wound is well made and both wound and tools sterilized against disease. Paints and waxes often fail to prevent disease or decay, because infection may have reached the wound before the covering was applied.

The author calls attention to the beneficial results found in other investigations in protecting the heartwood of large wounds with gas tar or liquid asphaltum to prevent decay while the relatively slow healing process is going on. These materials, however, should not be applied to the sapwood and cambium, as injury may result.

**Decade records of Ohio apple orchards, No. 1,** H. A. Gossard (*Mo. Bul. Ohio Sta., 4 (1919), No. 5, pp. 152–160, figs. 6*).—Long-continued spraying experiments were brought to a conclusion in 1918 in three fairly representative Ohio orchards. This paper records cultural and marketing practices, as well as yield and financial returns, for one of these orchards during a 10-year period. A record is also given of worminess in the orchard for each year under different spraying treatments.

The constant high record of clean fruit maintaining throughout the decade indicates that maximum effectiveness in applying the sprays was reached by the third season with an average of 98 per cent of clean fruit. The average yield per acre for the 10-year period was approximately 234 bu. The average annual cost of production per acre, figured at a cost of 40 cts. per bushel, was $93.60, and the annual net income per acre $100. Assuming that it costs 50 cts. per bushel to produce apples, as generally claimed among orchardists in Ohio, the net income per acre was about $80, indicating that even a good producing orchard does not offer the financial inducement sometimes put forth in orchard schemes.

**Pruning experiments with peaches,** M. A. Blake and C. H. Connors (*New Jersey Stas. Bul. 326 (1917), pp. 5–88, pls. 16*).—Experimental orchards were established both at Vineland and New Brunswick in 1912, with the view of comparing different systems of pruning as applied to varieties showing varying habits of growth such as the spreading, open habit; the compact spreading habit; and the upright habit of growth. The following five general forms of pruning were studied: Pruning out only such twigs as may have died or branches that may have been broken by accident; winter pruning to remove dead twigs, interfering and crossed branches and twigs, with a little top-thinning to prevent the formation of weak crotches and to admit sufficient light for the coloring of the fruit; winter pruning similar to the above, accompanied by cutting back the leading branches and twigs from one-third to one-half of the previous season's growth; summer pruning in which any suckers or undesirable shoots are removed during the growing season, and all leading shoots are pinched back during June or July to encourage a compact growth of the tree; and combined winter pruning and cutting back with summer pruning. All of the trees were cut back to a height of 18 in. when set, and the experiments in both orchards also included a comparative test of planting in dug holes as compared with holes made with dynamite. Measurements were made of the total linear twig growth and the circumference growth of the trees during the first season prior to the assignment of various pruning treatments. These measurements, together with growth data secured by different systems of pruning during the first two seasons after planting, are here presented in tabular form and discussed. No definite conclusions as to the actual effect of the various pruning treatments are drawn at this time.

Generally speaking, during the first season the trees at Vineland, where the soil is a sandy loam, averaged from about 200 to 350 in. more growth according

to the variety than at New Brunswick, where the soil is gravelly red shale loam. Considerable variation in total twig growth was found to occur between individual trees at the close of the first season. This apparently had no influence upon the growth of the trees in the second season, for whereas between some groups an average difference of 50 in. the first season was appreciable in the second season, between other groups an average difference of 100 in the first season was not noticeable the second season. In both the Vineland and New Brunswick experiments the smaller the circumference in 1912 the greater the percentage increase in circumference in 1913.

The data already secured indicate that permitting the development of branches, shoots, or suckers on the lower part of the trunk during the growing season tends to increase the girth of the trunk more rapidly than where such growth is removed and where the trunk is longer and the branches higher above the ground. In the summer pruned treatments the shoots are removed from the trunk, giving in almost every case a greater twig growth to each inch increase in trunk circumference. In the no pruning and winter pruning treatments the twigs were allowed to remain on the trunks, resulting in a narrow ratio of increase in trunk circumference to increase in twig growth. Where most of the growth is made at the very top of the tree it will have proportionally less influence upon the circumference of the trunk near the ground.

Summer pruning reduces the amount of the necessary thinning of twig growth in winter, but increases the amount of clipping back due to the increase in vigor of the secondary twigs on the leaders. The summer pruning of the combined winter and summer treatment reduced the pruning required in winter to about one-half at Vineland and from one-third to one-half at New Brunswick as compared with the winter and cut back treatment. Pinching back the main twigs increases the number of secondary or side twigs.

The summer pruning only treatment at Vineland made the greatest average total growth and the winter cut back treatment was second. At New Brunswick the no pruning treatment made the best total growth and the summer pruning only treatment was second. Summer pruning apparently did not affect or reduce the amount of twig growth made by the trees during the second season. Of the various treatments the winter pruning without cutting back was the cheapest and the combined winter and summer pruning the most expensive. The data thus far secured indicate that varieties having an upright habit with numerous twigs and branches are more expensive to prune than varieties with spreading, open habit growth.

**Pollination of the Bartlett pear**, W. P. Tufts (*California Sta. Bul. 307 (1919), pp. 369–390, figs. 8*).—The results are given of pollination studies conducted during the three seasons 1916–1918, to determine the relative sterility or fertility of the Bartlett pear under both foothill and valley conditions in California. Tests were made of suitable pollinizers for the Bartlett pear and the pollen viability of pears in general was also studied. The results of early investigators are briefly noted.

The Bartlett was found to be self-sterile under foothill conditions and self-sterile to a limited degree under valley conditions. Since no cases of intersterility were found to exist between pear varieties it is concluded that any variety overlapping in blooming period with the Bartlett may be expected to be an efficient pollinator. Pears resulting from cross-pollination did not appear to exhibit the same tendency to fall at the June drop as those resulting from self-pollinations. It is recommended that all Bartlett orchards should be provided with facilities for cross-pollination, and pollinating agencies such as the honeybee should also be provided. A list of varieties pollinating the Bartlett successfully is given.

"Reversion" and resistance to "big bud" in black currants, A. H. Lees (*Ann. Appl. Biol., 5 (1918), No. 1, pp. 11–27, pls. 4, figs. 2*).—A further contribution to the so-called reversion of black currants (E. S. R., 39, p. 646) leads the author to conclude that reversion is associated with and apparently caused by a check to the terminal growth through change of the terminal wood bud into either a big bud, a killed bud or blind bud, or a fruit bud. It may also be associated with aphis attack. It is characterized by four symptoms, "running off" or dropping of the fruit, unusual amount of lateral wood growth, sharp pointed leaves, and long, thin internodes. The mite resistance shown by varieties such as Seabrook Black is said to be due to the fact that in normal climates and seasons the mite kills the attacked growing point and thus starves itself. The form of reversion which occurs in young bushes before mite or aphis is present has not yet been accounted for.

The pruning of young vines, H. Daumas (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 40 (1919), No. 20, pp. 462–464, figs. 2*).—In the author's experience short pruning or pruning back to basilary buds during the early years of the life of a vine promotes a much better distribution of shoots, a better developed stock, and earlier bearing than the usual method of pruning back to short arms. The two methods of pruning are illustrated, and yield data are given for two vineyards of French vines growing on their own roots which came into satisfactory bearing at two years of age.

Notes on some hybrid bearers, E. Pée-Laby (*Vie Agr. et Rurale, 8 (1918), No. 34, pp. 132, 133*).—This comprises a brief review relative to the fertility and production of various hybrid grapes tested at the Toulouse Experimental Garden in 1918.

The hybrid bearers in 1918 at the Toulouse Testing Garden, E. Pée-Laby (*Vie Agr. et Rurale, 8 (1918), Nos. 35, pp. 144, 145; 39, pp. 215, 216; 42, pp. 280, 281; 46, pp. 357–359; 50, pp. 423–425*).—Notes are given on the resistance of various hybrid grapes to disease, as well as on their general cultural value.

The reconstitution in Champagne, G. Philipponnat (*Rev. Vit., 50 (1919), Nos. 1285, pp. 97–103; 1286, pp. 113–120*).—The results of experiments and observations dealing with the reconstitution of phylloxera-infested vineyards in the Champagne district are here recorded, including data on the adaptability and affinity of various graft stocks employed in the work of reconstitution.

Varieties of the Satsuma orange, L. B. Scott (*Cal. Citrogr., 4 (1919), No. 7, pp. 176, 199, figs. 4*).—A further contribution on varieties of the Satsuma orange occurring in the United States (E. S. R., 40, p. 342), in which the author furnishes information relative to various nurserymen growing distinct varieties of the Satsuma orange.

Some results from an experiment with pruning as compared with no pruning of full bearing Washington navel trees, A. D. Shamel (*Cal. Citrogr., 4 (1919), No. 7, pp. 174, 175, figs. 4*).—The author presents yield data based on pruning operations conducted in a commercial orchard during the 5-year period 1914–1919. The data, which indicated that the pruning operations resulted in a total loss of about $2 per tree for the entire period, are given chiefly with the idea of showing the undesirability of pruning in healthy and normal navel orange trees unless it is definitely known that such pruning will be beneficial instead of detrimental. It is not intended to discourage judicious pruning by experienced and careful pruners.

Improving the soil in a young orchard, J. A. Prizer (*Cal. Citrogr., 4 (1919), No. 8, pp. 202, 203, 226, figs. 6*).—A contribution from the California Citrus Substation, discussing methods of soil improvement in citrus orchards with special reference to practices at the station.

[Cacao, coffee, tea, and rubber in Uganda], S. SIMPSON and T. D. MAITLAND (*Ann. Rpt. Dept. Agr. Uganda, 1918, pp. 10–12, 17–23, 26, 29, 30, 33–36, 56–60*).—Notes are given on cultural and variety tests, including also tapping experiments with rubber, conducted in the Botanic Gardens at Entebbe and on various government plantations and estates.

**Cultivation of the Robusta types of coffee**, H. A. DEUTROM (*Dept. Agr. Ceylon, Leaflet 10 (1918), pp. 6, pls. 2*).—Practical suggestions are given on the culture of a number of varieties of coffee of the Robusta type that have been tested by the direction of the Ceylon Department of Agriculture.

**Pruning experiments with young tea**, E. A. ANDREWS (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 4 (1918), pp. 129–132, pl. 1*).—Data are given for the season 1917–18 of pruning experiments conducted at the Tocklai Experiment Station, Assam, with three varieties of tea.

**Report of chief gardener**, H. J. MOORE (*Ann. Rpt. Comrs. Queen Victoria Niagara Falls Park, 32 (1917), pp. 24–29, pl. 1*).—A general report on ornamental planting operations in the Queen Victoria Niagara Falls Park System, including descriptive notes on varieties of hardy and semihardy primulas, all of which have been tested in the park for at least two seasons.

**[Delphiniums, myosotis, and annual poppies at Wisley, 1917]** (*Jour. Roy. Hort. Soc., 43 (1919), No. 2–3, pp. 462–487*).—Descriptions are given of varieties tested at Wisley during 1917, including selected lists of meritorious varieties.

**The history of Ananas and Agave**, S. KILLERMANN (*Naturw. Wchnschr., 33 (1918), No. 35, pp. 497–503, figs. 3*).—A historical review of these genera, including references to cited literature.

**The dahlia** (*Missouri Bot. Gard. Bul., 7 (1919), No. 4, pp. 41–46, pls. 2*).—Cultural notes on the dahlia, including a list of some of the best varieties for decoration and cutting which were grown at the Missouri Botanical Garden in 1918.

**The American rose annual**, edited by J. H. MCFARLAND (*Harrisburg, Pa.: Amer. Rose Soc., 1919, pp. 184, pls. 11, figs. 5*).—As in previous editions (E. S. R., 39, p. 244) the annual for 1919 contains a report of the activities of the American Rose Society for 1918, notes progress on breeding and variety testing and other phases of rose growing, and contains numerous miscellaneous articles on roses and rose growing in various countries. The partial list of roses introduced in America is revised to March 10, 1919.

**New pillar rose**, W. VAN FLEET (*Jour. Heredity, 10 (1919), No. 3, pp. 136–138, figs. 2*).—The author describes and illustrates a rose seedling developed at the Bell Experiment Plat, Glendale, Md., which gives great promise as a new hardy pillar or low-climbing rose. The seedling, which bears pure white blossoms with prominent yellow stamens, is a result of applying pollen of a vigorous hybrid between the new Chinese *Rosa soulicana* and *R. setigera*, the wild Michigan or Prairie rose, to the stigmas of an unusually hardy seedling of *R. wichuraiana* that had the Tea rose Devoniensis as its pollen parent.

**Mildew-resistant roses; with some suggestions as to increasing their number**, W. EASLEA (*Jour. Roy. Hort. Soc., 43 (1919), No. 2–3, pp. 253–260*).—The author points out what various hybridists have already done toward breeding mildew-resistant roses, suggests lines of attack which might result in increasing the number of resistant varieties, and appends a list of roses which have proved to be more or less mildew-resisting.

**Hardy trees, shrubs, and flowers for Wisconsin homes**, F. A. AUST (*Univ. Wis. Agr. Ext. Serv. Circ. 112 (1919), pp. 15, figs. 6*).—Suggestions and plans for laying out and planting the home grounds, including lists of trees, shrubs, and flowers.

**Evergreens for the Northern Plains**, C. WEDGE (*Minn. Hort., 47 (1919), No. 5, pp. 203–209, fig. 1*).—Summing up his experiments in growing evergreens in northern Minnesota, the author concludes that the trees best adapted to the plains are the evergreens that are found in the eastern foothills of the Rockies, especially the strains that grow on the detached groups and buttes, where they have become inured to the hardships of the plains throughout generations of natural selection.

## FORESTRY.

**Modern forestry**, A. KUBELKA (*Moderne Forstwirtschaft. Vienna and Leipzig: Franz Deuticke, 1918, pp. X+190, pl. 1*).—A treatise on the selection system of forest management, based primarily on the author's successful experience on various private forests in carrying out the principles advocated by Wagner (E. S. R., 20, p. 645). A modification of Wagner's method of regeneration is advocated, in that the author recommends felling-strips 30 to 50 meters broad in coulisse-form arrangement, with a limited number of regeneration cuttings, whereas Wagner advocates the use of narrow border strips with many regeneration cuttings.

The subject matter is discussed under the following general headings: Principles of modern forest management; preparations for the installation of a natural working system with special reference to the selection-strip system; growing the most important timber species in the holes and gaps of the selection strips; and the application of the selection-strip system in modern forestry.

**Annual report of the State Forestry Board of the State of Minnesota for the year ending July 31, 1918**, C. C. ANDREWS ET AL. (*Ann. Rpt. State Forestry Bd. Minn., 1918, pp. 19*).—A review of the work of the board during the fiscal year 1917–18, with its recommendations for the subsequent biennium. A report on The Recent Forest Fires, by W. T. Cox, is included.

**Reports of the forest branch of the Department of Lands for the years ending December 31, 1917, and 1918**, M. A. GRAINGER (*Rpt. Forest Branch Dept. Lands, B. C., 1917, pp. 11–26, figs. 3; 1918, pp. 27, figs. 2*).—Statistical reports of the work on land classification, yields in major and minor forest products, export trade, forest fires, revenues, expenditures, etc., in British Columbia are given for the calendar years 1917 and 1918, respectively.

**A forest policy for Louisiana**, R. D. FORBES (*Jour. Forestry, 17 (1919), No. 5, pp. 503–514*).—As a result of 14 months' study of Louisiana conditions, the author briefly classifies the lands of Louisiana from the standpoint of their value for agriculture, live-stock production, and forest growth, and presents the broader phases of what he considers the proper state forest policy to be carried out by the State forester, working under the Commissioner of Conservation.

**How can the private forest lands be brought under forest management?** W. N. SPARHAWK (*Jour. Forestry, 17 (1919), No. 5, pp. 490–496*).—The author critically reviews plans already advocated for bringing about the practice of forestry on private lands, and presents a plan by which it is believed that the practice of forestry on lands now in private ownership may be made entirely practicable. This plan is essentially a leasing system, which provides for the retention of private ownership with public operation.

**Public control of private forests in Norway**, S. T. DANA (*Jour. Forestry, 17 (1919), No. 5, pp. 497–502*).—A review of the Government policy with respect to private forests in Norway, with special reference to its bearing on the private forestry question in the United States.

**Afforestation**, J. BOYD (*London: W. & R. Chambers, Ltd., 1918, pp. 40*).—A discussion of afforestation problems in Scotland, with special reference to national afforestation on land purchased or rented for the purpose from the present owners.

**The realizable resources of German forests**, G. HUFFEL (*Les Ressources Réalisables des Forêts Allemandes. Paris: Berger-Levrault & Co. [1918], pp. 15*).—A brief statistical study of German forest resources.

**Present status of forest taxation in the United States**, M. K. MCKAY (*Jour. Forestry, 17 (1919), No. 5, pp. 472–489*).—A discussion of recent Federal and State legislation dealing with forest taxation, including a summary of the laws concerning taxation of wooded lands in various States.

**Aerial photography and National Forest mapping**, R. THELEN (*Jour. Forestry, 17 (1919), No. 5, pp. 515–522, fig. 1*).—The author briefly outlines the manner of making aerial photographs and maps; sketches the requirements of National Forest surveys and reconnaissance, and present methods of meeting the principal of these requirements; and discusses the possible value of aerial photography as an adjunct or supplement to these methods.

**A forest reconnaissance of the Delaware peninsula**, R. M. HARPER (*Jour. Forestry, 17 (1919), No. 5, pp. 546–555, fig. 1*).—The results of a study of the vegetation of the Delaware peninsula, especially the trees, are here brought together as a preliminary forest census of the area, both as a contribution to our knowledge of the forest resources of the United States and also to depict some significant relations between soil and vegetation in an area where differences of topography and climate are practically eliminated. A method of tabulating forest resources where the fieldwork has not been sufficiently thorough to warrant one in assigning percentages to each species is also illustrated.

**A sketch of the forestry geography of New Jersey**, R. M. HARPER (*Bul. Geogr. Soc. Phila., 16 (1918), No. 4, pp. 1–19, pls. 3, fig. 1*).—A study of the original distribution of forest species in New Jersey.

**Micrography of the woods of Javanese trees, IV–V**, J. W. MOLL and H. H. JANSSONIUS (*Mikrographie des Holzes der auf Java vorkommenden Baumarten. Leyden: E. J. Brill, vol. 3, 1914, pt. 4, pp. 336, figs. 39; vol. 3, 1918, pt. 5, pp. 337–764, figs. 40*).—The present volume comprises the fourth and fifth parts of a report on the study of the wood anatomy of Javanese trees which the authors have conducted since 1903. Some 208 species are described along the lines previously noted (E. S. R., 25, p. 543).

**Analyses of some morphological characters of Bombay woody species from an ecological standpoint**, L. J. SEDGWICK (*Indian Forester, 45 (1919), No. 4, pp. 193–199*).—An analysis is given of the leaf apex, armature, and methods of seed dispersal of a number of evergreen, deciduous, xerophytic, and maritime species.

**Coniferous trees**, A. D. WEBSTER (*London: Constable & Co., Ltd., 1918, pp. XV+298, pls. 28*).—This work contains concise descriptions of the species and varieties of conifers, with the most recently approved nomenclature, a list of synonyms, and cultural notes. Chapters are also included which deal with the commercial aspect of conifers, quality and value of British-grown coniferous timbers, conifers for various soils and situations, conifers of different characteristics, propagating conifers, enemies of conifers, etc.

**Lignum-vitæ, the vital wood**, S. J. RECORD (*Sci. Amer. Sup., 88 (1919), No. 2270, pp. 4, 5, 15, 16, figs. 6*).—An account of the uses of lignum-vitæ, with special reference to its importance to the American Navy and merchant marine, and its present and future sources of supply.

**On a new species or form of Eucalyptus**, C. HALL (*Proc. Linn. Soc. N. S. Wales, 43 (1918), pt. 4, pp. 747–749, pl. 1*).—This comprises a botanical descrip-

tion of a form of Eucalyptus, which has been designated *Eucalyptus marsdeni* n. sp., occurring in New South Wales. The appearance and structure of the wood as well as the character of oil obtained from this species are also described.

**The effect of lightning on Hevea**, A. A. L. Rutgers (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 4, pp. 163–171, pls. 11*).—A discussion, with illustrations, of various types of injury to Hevea rubber trees caused by lightning.

## DISEASES OF PLANTS.

**Ecological conditions of development of parasitic fungi**, J. Dufrénoy (*Bul. Trimest. Soc. Mycol. France, 34 (1918), No. 1–2, pp. 8–26*).—Of the three sections comprising this article, the first deals with altitude as related to the distribution of parasitic fungi, including such significant factors as heat, light, and moisture; the second with the virulence of rusts; and the third with such biotic factors as the presence of other fungi and of insects.

The Pyrenees offer no obstacle to the spread of fungus diseases, although the study of disease fungi shows the existence of species adapted to mountain regions, to plains, or to both. The principal factor determining specialization appears to be insolation rather than temperature or humidity. Mountain species may be protected by strong coloration of the hosts or by that of their own spores, the less strongly pigmented species of lower levels not being able to bear the more intense insolation at the greater altitudes.

**Some of the plant diseases that were especially serious this season, with suggestions** (*Iowa Sta. Rpt. 1918, pp. 28, 29*).—Notes are given on a number of plant diseases and suggestions are made for their control. It is stated that seed treatment with formaldehyde did not prove fully adequate for the control of wheat scab, but it is thought that coupling this treatment with the avoidance of the use of highly infected seed will prove practicable. Black chaff, another wheat disease, is reported as quite prevalent, but it is thought from the record of disease surveys that not much damage need be anticipated from this source.

Cedar apple rust is said to have been abundant, seriously damaging Wealthy apples, and the removal of red cedars near apple orchards is recommended.

The late blight of potatoes was troublesome in the northeastern part of the State, and for the control of this disease thorough spraying with Bordeaux mixture is recommended.

**Plant disease survey and information service**, H. H. Whetzel (*Rpt. N. Y. State Food Sup. Com., 1917, pp. 44, 45*).—The leader of this service reports that in addition to other work done, over 500 specimens of diseased plants have been examined.

**Prevention of insect pests and plant diseases** (*Rpt. N. Y. State Food Com., 1918, pp. 108–110*).—This is a brief statement of the work, chiefly informational and advisory, of the three experts on insect pests and plant diseases employed to assist farmers and fruit growers, their work being confined mainly to Wayne, Orange, and Cortland Counties.

**A quick method of eliminating seed-borne organisms of grain**, I. E. Melhus and L. L. Rhodes (*Science, n. ser., 50 (1919), No. 1279, p. 21*).—From studies made on account of the injury to seed treated with hot formaldehyde, the authors have found that suspending the grain above the formaldehyde solution for about 20 seconds destroyed all the fungi in or on the seed, as well as the majority of the bacteria present. The formaldehyde solution used was 1:240, and it was raised to a temperature of from 98 to 99° C. (208.4 to 210.2° F.). The short treatment did not injure the germinating capacity of the seed, while

the fungus flora was destroyed. It is believed that this method can be made practical for the control of scab and other seed-borne diseases of grain.

**Presoaking as a means of preventing seed injury due to disinfectants and of increasing germicidal efficiency**, H. Braun (*Science, n. ser., 49 (1919), No. 1275, pp. 544, 545*).—In the course of investigations of the bacterial black chaff disease of wheat, the author discovered a means of disinfecting without injuring the seed. This is accomplished by allowing the seed to absorb water for a definite period in advance of treatment. The wheat, after screening and removal of shriveled grains, is soaked for 10 minutes in water, drained, and kept moist for 6 hours, after which it is soaked for 10 minutes in formalin (1:400), drained, covered for 6 hours, dried overnight, and planted. If copper sulphate is used, the presoaked seed are thoroughly wetted in the 1:80 solution for 10 minutes, drained, and kept moist for 20 minutes, after which they are plunged for a moment in milk of lime, dried overnight, and planted. The effect of this method of seed treatment is said to be twofold—first, seed injury is prevented by dilution of the disinfectant as it enters the presoaked tissues of the seed, and, second, the efficiency of the disinfectant on the pathogene is increased.

**The black chaff of wheat**, E. F. Smith, L. R. Jones, and C. S. Reddy (*Science, n. ser., 50 (1919), No. 1280, p. 48*).—As a result of a study of black chaff of wheat, the authors were struck with the resemblance of the organism causing this disease to that which is responsible for the bacterial blight of barley which has been named *Bacterium translucens* (E. S. R., 38, p 548). Cross inoculations of the barley organism on wheat either proved it noninfectious or resulted in the production of small, nontypical lesions. On the other hand, inoculation experiments with the wheat organism showed that it was practically as pathogenic on barley as it is on wheat. Some minor cultural differences were observed, and it is believed that the wheat organism should be distinguished from that on barley. For the present the name *B. translucens undulosum* is given it.

This organism, which causes the black chaff disease of wheat, is said to produce yellow or translucent stripes on the leaves, water-soaked or black stripes on the culms, and longitudinal, more or less sunken, dark stripes or spots on the glumes. The organism also attacks the kernels, especially at the base, causing them to be shrunken or honeycombed. Where the kernels are not directly attacked, their surface is liable to be affected from the diseased glumes. When the disease appears early and is severe, dwarfed heads are said to result. Infections have been obtained repeatedly on wheat leaves and glumes, and the disease is considered to be transmitted to the young seedlings through the wheat kernels.

The black chaff of wheat is known to occur in all the wheat States of the Middle West.

**Formaldehyde v. corrosive sublimate in treating cabbage seed** (*Iowa Sta. Rpt. 1918, p. 27*).—On account of unsatisfactory results in treating cabbage seed with formaldehyde, a test has been made comparing formaldehyde and corrosive sublimate. It is reported that a solution consisting of 1 gm. corrosive sublimate in 1 qt. water has been found to do little injury to the seed and at the same time to kill the disease-producing organisms on the seed.

**Black spot of onion sets**, F. L. Stevens and E. Y. True (*Illinois Sta. Bul. 220 (1919), pp. 507–532, figs. 19*).—Serious losses in storage are reported to have occurred in onions, particularly in onion sets and especially in the white varieties. Examinations were made of onions and onion sets, and it was found that the white varieties were affected to the extent of 60 to 80 per cent by the disease formerly described under the name *Vermicularia circinans*. Three types

of disease are recognized, the most common one being that usually described and figured as due to Vermicularia. This is characterized by the occurrence on the dry outer scales of the bulbs of circular black spots 15 to 25 mm. in diameter. The second type of the disease is said to occur on the dry outer scales, but it is usually limited to the upper part of the bulb. It is distinguished from the first type by the invasion of the fungus starting at the top of the bulb and usually stopping with the drying of the scales before the equatorial region is reached. It is thought that this type probably results from infection through wounds caused in removing the tops. The third type of the disease is manifest in the bulb scales while still succulent and juicy. The chief manifestation is said to be the formation of tubercles or warty growths. This form of the disease often remains progressive until the scales dry and inhibit further progress.

A study was made of the various phases of the fungus, and it has been determined that the conidial form belongs to the genus Volutella. The name *V. circinans* is given it. The perithecial stage has been determined, and is described as *Cleistothecopsis circinans* n. g. and sp.

It has been ascertained from observations that moisture favors the development of the fungus, and it is suggested that onion sets be dried as rapidly and thoroughly as possible after they have been harvested. Artificial drying in rooms properly equipped for the purpose is considered the most promising method for checking the progress of this disease and reducing losses from rot.

**Potato insect and disease control**, W. H. Rankin (*Rpt. N. Y. State Food Sup. Com., 1917, pp. 30–36*).—An account is given of preliminary work and community, individual, and demonstration spraying, with results therefrom.

**Leaf roll and mosaic of potatoes**, I. H. Vogel (*Proc. N. Y. State Potato Assoc., 1918, pp. 21–24*).—Leaf roll was somewhat generally distributed during the previous season, the number of infected plants found in hills inspected ranging from 0 to 80 per cent, with an average of about 25 per cent. It seems to occur in all varieties, some developing the disease apparently as a response to the influence of unfavorable environment. Certain climatic conditions are important predisposing causes, among which warmth and dryness are prominent.

Mosaic was quite generally distributed in 1918, the degree of infection also ranging between 0 and 80 per cent with a corresponding reduction in yield. Data which are mentioned are said to indicate that the percentage of mosaic infection from the same strain is about the same in Northern as in Southern States. Experiments are in progress bearing upon the possible agency of insects in the spread of the disease.

The most rapid progress in the elimination of either disease is said to be attained by employing a seed plat as a source of seed for field planting. The proper management of the seed plat is indicated.

**A new method of treating seed potatoes for scab** (*Iowa Sta. Rpt. 1918, p. 27*).—A method of treating seed potatoes with formaldehyde is described in which the potatoes are soaked from 3 to 5 minutes in a solution composed of 2 pints formaldehyde in 30 gal. water, the solution being held at 122° F.

In order to facilitate handling in large quantities, a machine has been devised by which the potatoes are drawn through the hot solution on an endless chain. This machine has proved efficient for treating 100 bu. an hour.

**Potato spraying profitable** (*Iowa Sta. Rpt. 1918, p. 36*).—As a result of spraying experiments covering a period of five years, spraying with Bordeaux mixture is recommended. Five applications are said to have given an increase in yield of 17 per cent, three applications proved not to be sufficient, and seven represented a diminishing net return.

A fungus disease of prickly pear, G. P. Darnell-Smith and H. Ross (*Agr. Gaz. N. S. Wales, 29 (1918), No. 6, pp. 440, 441, fig. 1*).—At Harrington Inlet on the Manning River, a disease affecting the pest prickly pear (*Opuntia inermis*) was studied by the authors, who found many of the young segments dead and older ones rotten and filled with slimy pulp. Others showed a sickly yellow color in areas where diseased segments had been thrown into clumps of healthy plants. The infection usually starts at or near the base of the segments, being marked by concentric dark lines in the latter case. The disease may, it is thought, afford means of control for prickly pear.

Influence of soil environment on the root rot of tobacco, J. Johnson and R. E. Hartman (*Jour. Agr. Research [U. S.], 17 (1919), No. 2, pp. 41–86, pls. 8, figs. 2*).—A report is given of a study undertaken cooperatively by the Wisconsin Experiment Station and the Bureau of Plant Industry, U. S. Department of Agriculture, with a view of determining the environmental conditions which might influence the tobacco root rot caused by *Thielavia basicola*.

There seems to be no variation in the pathogenicity of the fungus secured from different sources, the amount of disease being determined by the susceptibility of the host, the amount of infection, and the soil environmental factors surrounding the roots of the host. Moisture, temperature, reaction, physical structure, and fertility of the soil were investigated, and under normal conditions the amount of injury due to root rot is said to be determined by the sum total of the favorable and unfavorable action of these factors on the disease. Root rot is apparently capable of developing in relatively dry soils, but increasing the moisture content up to three-fourths of the water-holding capacity was not found to materially increase the amount of disease. Saturated soils, however, are considered more favorable to the disease than unsaturated ones.

Studies of soil temperature carried on for four seasons have indicated that the occurrence of root rot is determined primarily by soil temperature, the most favorable temperature for the disease ranging from 17 to 23° C. Below 15° the disease is less marked, and above 26° the severity is gradually reduced until, at about 29 or 30°, the disease has little or no influence. At 32° practically no infection occurs, even in the most heavily infested soils.

Root rot is said to be checked by high soil acidity, but tests of tobacco soils in Wisconsin indicate that the use of acid fertilizers will not reduce infection by *T. basicola*. Organic matter present or introduced into the soil was not found to play an important part in the amount of infection, although a high organic content of the soil is believed to favor infestation and also to aid the fungus in persisting in the soil. Clay soils were found no more favorable to infection than sand and under some conditions possibly less so. Clay may, however, favor the persistence of the parasite in the soil. Fertilizers applied to heavily infested soils under practical conditions are considered to be largely wasted except in seasons in which such high temperatures result that the disease is held in check. Field observations, as well as limited laboratory experiments, are thought to show that infested soils when compacted are more favorable to the disease than loose, open soils. Transplanting infected seedlings to an uninfested field is considered a bad practice, although recovery from the disease may occur.

Fruit insect and disease control, L. R. Hesler (*Rpt. N. Y. State Food Com. Sup., 1917, pp. 36–38*).—Brief notes are given of the working of a plan employing, besides ordinary means, an extensive telephone relay system organized in some counties of New York, over which the field agent in Wayne County was able to send out two days before a rain period was due the recommendation

that a spraying of lime-sulphur and lead arsenate be applied. This was sent to committeemen who by prearrangement passed it on until every grower was reached. It is stated that great savings have been effected by following this plan of organization, which is to be extended.

**Apple blotch, a serious fruit disease**, A. D. SELBY (*Ohio Sta. Bul. 333 (1919), pp. 491–505, figs. 5*).—According to the author, the apple blotch due to *Phyllosticta solitaria* has become a serious menace to apple production in southern Ohio. The characteristics of the disease are described, and it is stated that fruit affected by the blotch is rendered unsightly and is at times distorted and malformed. The juiciness of the fruit is considerably reduced. On the twigs cankers are formed, and the fungus is said to live over winter in the cankers on the twigs. The leaves and leaf stalks are also attacked in a characteristic manner.

A review is given of experimental work that has been reported for the control of this disease, and, based very largely on work done outside of Ohio, the author suggests methods of control. These include proper pruning, spraying, and working over orchards that are planted to specially susceptible varieties of apples.

**The control of crown gall of apples** (*Iowa Sta. Rpt. 1918, p. 26*).—A brief report is given on two years' experiments in which a number of fungicides were tested to determine their value in preventing crown gall of apples.

In most instances the materials used proved of little value. However, a thick paste composed of copper sulphate and lime into which the grafts were dipped just before planting has given rather promising results. The mixture sticks to the union, does not interfere with the healing process, and seems to kill the organisms that come in contact with the young tree. This method of treatment has been tried for two seasons with such satisfactory results that a nursery company treated this year about 500,000 apple trees preparatory to setting them out.

**Powdery mildew of the apple**, W. J. ALLEN and W. LE G. BRERETON (*Agr. Gaz. N. S. Wales, 29 (1918), No. 6, pp. 408–412*).—Noting results of experiments with various fungicides carried out since 1915, the author states that from this work, which is still in progress, it can be concluded that all mildewed terminal buds or affected wood should be removed and burned at the time of winter pruning. Iron sulphid should be applied as a spray first in the pink stage before the petals begin to open, second in connection with the calyx spray (arsenic) for codling moth, third three weeks later with a second arsenic spray, and fourth with a third arsenic spray.

Apparently this treatment is more effective for the second season, due to the weakening effect of the first year's spraying on the fungus.

**Control of black raspberry anthracnose and tip blight** (*Iowa Sta. Rpt. 1918, pp. 26, 27*).—These two diseases are said to be quite prevalent in the State, and experiments for their control were conducted at Council Bluffs. Lime-sulphur and Bordeaux mixture were tested, three applications being given. No tip blight developed during the season, so that the report of the experiments applies only to the anthracnose. Both fungicides checked the disease, but lime-sulphur seemed more efficient than Bordeaux mixture in this respect.

**Development and treatment of grape downy mildew**, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 38 (1917), Nos. 48, pp. 529–531; 50, pp. 577–581; 39 (1918), Nos. 2, pp. 25–29; 4, pp. 73–76; 6, pp. 121–125, fig. 1*).—The author gives results of studies on grape downy mildew as carried on since 1914 in the School of Agriculture at Montpellier.

It is stated that the chemical composition and the physical state of copper fungicides depend largely upon the proportions employed and the mode of

preparation, Burgundy mixture, for example, prepared by pouring copper sulphate into soda having very different composition and properties from that involving the reverse process. The qualities of several liquids tested are discussed, as are various periods more or less favorable to the success of fungicidal applications; the relative efficacy of acid, alkaline, and neutral sprays and of the constituents lime, soda, and carbon dioxid; the significance of a difference in the physical, associated with an apparent similarity in the chemical, composition of the precipitate; the production and significance of adherence by different devices; and the effect of concentration.

It is concluded that Burgundy prepared by slow or rapid pouring of either main component into the other, with or without rapid stirring, gives practically the same results whether the reaction be acid, alkaline, or neutral, but that when the precipitate has changed from blue to greenish-yellow and has passed into the globular state it is almost without effect on downy mildew. This change is more or less rapid according to the temperature and reaction of the mixture and other complicating circumstances, such as the presence of carbon dioxid and the adherence of fine crystals to the leaves.

Bordeaux is fully as efficacious as Burgundy mixture against downy mildew. It is claimed that the occasional burning of leaves by the use of neutral or alkaline Bordeaux mixture is due to the fact that the lime reacts with the copper compound to form copper carbonate.

**A consideration of [carnation] yellows**, E. M. R. Lamkey (*Proc. Amer. Carnation Soc., 26 (1917), pp. 25–35*).—In a discussion of carnation yellows it was stated that diseased plants show closure of the stomata, reduction in quantity or quality of diastase resulting in starch accumulation, and excessive production of oxidase which interferes with certain physiological functions. Other internal changes are mentioned as being under investigation. Suggestions on the improvement of the general situation in regard to yellows include control and improvement of environmental conditions, mainly with a view to prevention, and employment of strictly healthy plants to furnish cuttings. It is noted that a few plants of the cuttings of 1915 seedlings have become badly yellowed. The suggestion is made that these plants may have acted in a way analogous to the behavior of human carriers of disease.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Mutanda ornithologica, VII**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), pp. 127, 128*).

**The status of the genus Centronyx Baird**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 141*).

**The proper name for Limicola platyrhyncha**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 140*).

**The taxonomic position of the genus Ramphalcyon**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 140*).

**The generic name of the rook**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 141*).

**The status of the subgenus Sieberocitta**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), pp. 135–137*).

**Spizella arborea the proper name for the tree sparrow**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 139*).

**Methods in entomological field experimentation**, W. P. Flint, C. F. Turner, and J. J. Davis (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 178–183, pl. 1*).

**Organization for insect suppression**, A. F. Burgess (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 136–141*).

**The value of crude arsenious oxid in poison bait for cutworms and grasshoppers**, J. J. Davis (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 200–203*).—This is a brief summary of tests made by entomologists in various parts of the country of finely powdered crude arsenious oxid obtained from a Montana copper smelter, a test of which on the army worm has been previously noted (E. S. R., 39, p. 361). Good results were obtained in its use against grasshoppers and cutworms. The author considers it a satisfactory and reliable substitute for Paris green at about one-seventh the cost. Only the powdered grade is recommended.

**Sulphate of ammonia as an insecticide**, E. D. Colón (*Porto Rico Dept. Agr. Sta. Circ. 15 (1919), Spanish Ed., pp. 3–6; Sugar [New York], 21 (1919), No. 7, pp. 396, 117*).—Attention is called to the insecticidal properties of sulphate of ammonia when it is applied to soil infested with the white grubs which attack sugar cane. The author quotes from a report by Illingworth[1] of observations of its use in Australia.

**[Report of the] department of entomology**, H. C. Severin (*South Dakota Sta. Rpt. 1918, pp. 18–21*. This report deals with investigations that have been conducted with the web spinning sawfly (*Neurotoma inconspicua*) and the common field cricket (*Gryllus abbreviatus*).

*N. inconspicua* was found to be highly parasitized by a tachinid, said to represent a new genus and species, which destroyed from 40 to 60 per cent of the larvæ at times. Liquid sprays consisting of lead arsenate 2 lbs. to 25 gal. of water or a 5 per cent kerosene emulsion are said to be the most satisfactory control measures.

In the experimental destruction of *G. abbreviatus* in alfalfa fields at Capa, poison baits, consisting of (1) bran 25 lbs., blackstrap molasses 2 qts., 6 oranges, and water 4 gal., and (2) fresh horse manure 25 lbs., blackstrap molasses 2 qts., 6 oranges, and water 4 gal., gave very satisfactory results.

**Notes on some little-known pests of red clover**, G. W. Herrick and J. D. Detwiler (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 206–209, figs. 3*).—The notes here presented relate to the lesser clover leaf weevil (*Phytonomus nigrirostris*), the clover head weevil (*P. meles*), and the clover Tychius (*Tychius picirostris*).

**Internal disease of cotton bolls in the West Indies, II**, W. Nowell (*West Indian Bul., 17 (1918), No. 1, pp. 1–26, fig. 1*).—The author reports a continuation of studies previously noted (E. S. R., 39 p. 754), referring chiefly to conditions in St. Vincent late in 1917 and to the activities of bugs other than *Dysdercus* spp., more particularly to those of the green bug (*Nezara viridula*). He states that the control measures employed against the cotton stainer have reduced the trouble to negligible proportions over large areas of that island, although in some localities severe infestations by the green bug and pea chink (*Edessa meditabunda*) were found worthy of study.

Punctures of the bolls by bugs, in particular the green bug, cotton stainers, and the leaf-footed bug, and resulting injury to the seeds, check growth of the lint, and cause drying or shedding of young bolls. Experiments on the effect of confining bugs from known food plants on previously protected bolls give evidence that the punctures by the green bug readily cause infection with the fungi of internal boll disease, but only when the bugs are transferred from infected plants. The same observation was made in the case of the pea chink.

**Important foreign insect pests collected on imported nursery stock in 1918**, E. R. Sasscer (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 133–136*).—A brief account is given of the more important species intercepted.

[1] Queensland Agr. Jour., 10 (1918), No. 6, pp. 258, 259.

Experiments with poison baits against grasshoppers, D. A. Ricker (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 194–200*).—This is a report of experiments conducted in the vicinity of Janesville, Wis., where the red-legged locust, *Melanoplus atlanis*, and *M. bivittatus* occurred in greatest numbers and nearly all were almost mature at the time of the experiments.

In the tests of the attractiveness of different baits based upon the standard formula, apples and bananas when used alone or with molasses were as attractive as, or slightly more so than, lemon fruit or lemon extract. Apples and molasses gave practically the same results as lemon fruit and molasses, while lemon fruit and salt gave practically the same results as molasses and salt, but both were slightly less effective than the first two combinations. Salt alone seemed to give slightly better results than molasses alone. In all cases bananas showed as good results as lemon fruit and seemed to give a heavier early mortality.

In determining the period of attractiveness of different fruits, it was found that citrus fruits become flat within a day or two after application, whereas the noncitrus fruits increased in odor and attractiveness as fermentation progressed. It was found that the young hoppers responded better toward the more odorous bait.

In tests of the comparative value of different arsenicals it was found that wherever crude arsenious oxid was used in a direct comparison with Paris green, as was the case in 6 experiments in which applications covered approximately 65 acres, very little choice could be found, both working with nearly the same rapidity and being equally effective. Calcium arsenate used in 4 experiments in direct competition with both Paris green and crude arsenious oxid gave equally as good results. The addition of lemon extract to the standard formula made a much more odorous bait and proved effective at the usual rate of application, while the standard bait used at the rate of from 6 to 8 lbs. per acre gave efficient results. It is pointed out that the rate of application appears to depend upon the infestation and attractiveness of the bait.

**Grasshopper control in Kansas**, G. A. Dean, E. G. Kelly, and A. L. Ford (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 213–217, pl. 1*).—A brief report of work carried on during one of the worst grasshopper outbreaks in the history of Kansas, which took place in the summer and fall of 1918.

**Palmodes præstans and its prey**, A. N. Caudell (*Proc. Ent. Soc. Wash., 21 (1919), No. 2, p. 40*).—*Capnobotes fuliginosus*, an orthopteran, is said to have been captured by *P. præstans*, a wasp which is scarcely one-third the length of its prey.

**Leaf hoppers injurious to apple trees**, F. H. Lathrop (*New York State Sta. Bul. 451 (1918), pp. 185–200, pls. 4, figs. 2*).—Among the serious insect enemies of the apple in New York State are the three species of small leaf hoppers here reported upon by the author, namely, the apple leaf hopper, *Empoasca unicolor*, and *Empoa rosæ*.

Contrary to certain recorded observations the apple leaf hopper, of which two generations were observed, hibernates largely, if not exclusively, in the adult stage. On the other hand, *E. unicolor* spends the winter in the egg stage and is single brooded; *E. rosæ* overwinters in the egg stage, largely on roses, although a few eggs are placed on apples, and has two generations. These species differ considerably in feeding habits, the apple leaf hopper obtaining its food almost exclusively on tender terminal growth and causing a characteristic curling of the foliage, while *E. rosæ* and *E. unicolor* feed largely on older leaves and may be found on young and older apple trees, *E. rosæ* being more abundant on older trees and *E. unicolor* on the younger trees. The leaves attacked by these two species display white stippling on the upper surfaces.

In experiments with leaf hoppers as carriers of fire blight (*Bacillus amylovorous*), positive results were obtained with the apple leaf hopper but no infections were noted in similar efforts with the other species.

A number of natural enemies were observed, including *Anagrus armatus* which parasitizes the egg. Control measures consist chiefly in protection through spraying with soap and nicotin mixtures to combat the younger nymphs. The destruction of weeds which harbor the insects serves as a supplementary measure.

"In a series of spraying tests in which soap, nicotin, and kerosene emulsion were also compared, a high degree of effectiveness was indicated for a spraying mixture of nicotin sulphate 1 pint, lump lime 60 lbs., copper sulphate 4 lbs., and water 100 gal."

The life histories as observed at the station are illustrated in the following diagram (fig. 2):

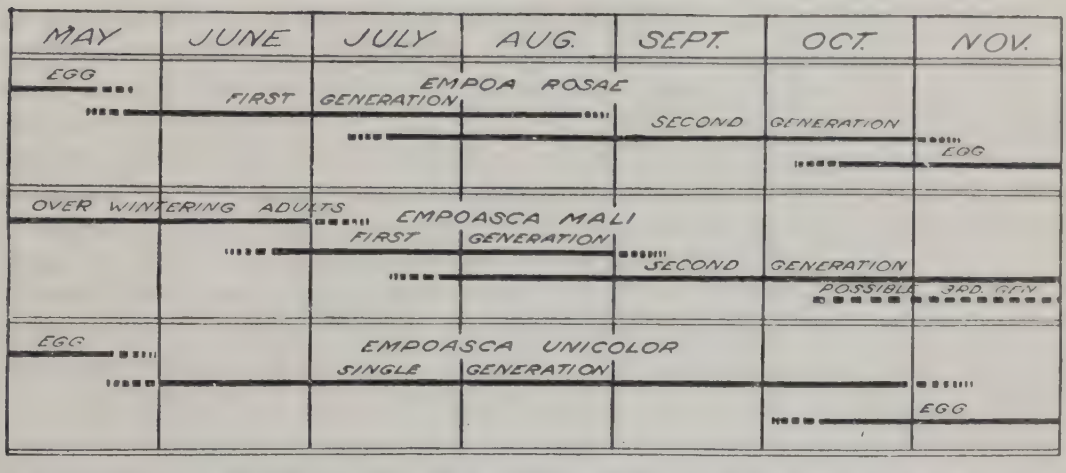


FIG. 2.—Diagram of life histories of leaf hoppers injurious to apple trees as observed at Geneva, N. Y.

**Leaf hoppers injurious to apple trees,** F. H. LATHROP (*New York State Sta. Bul. 451, popular ed. (1918), pp. 3–6, fig. 1*).—A popular edition of the above.

**A new genus for Tettigonia trifasciata (Homoptera; Euptergidæ),** W. L. MCATEE (*Proc. Biol. Soc. Wash., 32 (1919), pp. 121–123, figs. 2*).

**Preliminary key to the Nearctic species of Eupteryx (Homoptera; Eupterygidæ),** W. L. MCATEE (*Ent. News, 30 (1919), No. 7, pp. 182–186*).

**Some studies on the eggs of important apple plant lice,** A. PETERSON (*New Jersey Stas. Bul. 332, pp. 5–63, figs. 17*).—This detailed report of investigations on the structure, behavior, and susceptibility of the eggs of three important aphidids found on apple trees (*Aphis avenæ*, the apple aphis, and *A. sorbi*) is summarized in part as follows:

A morphological study of the eggs of these three apple plant lice "shows two distinct layers in the eggshell, an outer semitransparent layer which is soft and glutinous when the egg is deposited, but hardens and becomes somewhat tough (maybe brittle) and impervious upon long exposure to weather, and an inner, soft, elastic, membranous, black layer. A third layer, thin and membranous, may be seen about the nymph when it starts to emerge. This skin is probably the first exuvium, since it is shed by the nymph as it emerges.

"Under out-of-door conditions the outer layer of the egg usually splits along the dorsomesal line a number of days (2 to 30 or more for *A. avenæ*) before the nymph emerges. So far as observed under greenhouse conditions the eggs of all three species split their outer covering at least a few hours before the pigmented layer is severed. In 1918 the first eggs of *A. avenæ* with split outer

coverings were seen on February 15, and when the first nymphs emerged, on March 21, approximately 95 per cent of the normal live eggs (45–50 per cent of the eggs were dead) had split their outer semitransparent covering.

"These observations on the morphology and behavior of the egg coverings show conclusively that the egg is not a hard resistant body, and that it goes through a critical change previous to the emergence of the nymph. It is in the midst of this critical period that the egg is most susceptible to evaporating factors and certain contact insecticides.

"The outer semitransparent layer of the egg is somewhat impervious to water; consequently, the water content of the embryo does not undergo very much evaporation in moist weather, or in other words, when low evaporating factors exist, such as high humidity, low temperature, and probably small wind velocity. The outer layer, however, is not entirely impervious, for extreme drought will cause the vast majority of the eggs to shrivel and never hatch. In other words, low humidity, high temperature, and probably air velocity undoubtedly bring about a greater evaporation of the water content of the embryo, and thus destroy the living form. The inner pigmented (black) layer of the egg is not an efficient protector against evaporation. Numerous and varied experiments at the laboratory and observations made on the percentage of hatched eggs, of *A. avenæ* during the past two totally different seasons, 1917 and 1918, show conclusively the pervious nature of this layer. The eggs are most susceptible to evaporating factors and contact insecticides the latter part of March, or in other words, when the greatest number shows a split outer layer, and this occurs when the first nymphs start to emerge.

"Experiments conducted in the laboratory under controlled percentages of moisture and also experiments where similar eggs of *A. avenæ* were kept out-of-doors during the critical period (February 15 to March 31, and especially important March 15 to March 31) in 1917 which was wet, while in 1918 this period was dry, show quite conclusively that the percentage of hatched eggs is much higher in a low evaporating environment than in a high evaporating medium.

"Contact insecticides probably prevent the egg from hatching in several ways. From a physical viewpoint some substances tend to harden the outer semitransparent shell (lime-sulphur) and this makes it impossible for the nymphs to split the hardened layer. This hardening effect may be due to desiccation. Desiccating substances may also remove the water content of the embryo within, especially if applied after the outer layer has split. Other substances soften and disintegrate the outer impervious layer (crude carbolic acid and cresols) and thus expose the inner pigmented layer to evaporating factors. The above physical reaction of contact insecticides on eggs of aphids may be important, but it is probable that the toxic effect upon the embryo of various contact insecticides is more important. So far, no technique has been found which will determine the penetrative ability of the various chemicals used. . . .

"We can safely recommend as a control measure for aphids a delayed dormant spray of lime-sulphur (1:8 or 1:9) combined with nicotin (blackleaf 40) 1:500. The combined spray kills 98 to 100 per cent of all the eggs that are coated and will also kill all the newly hatched nymphs, provided they are hit with the spray. Dormant lime-sulphur (1:9) by itself will kill a large percentage (90 per cent or better) of the eggs, but not enough to rely upon it alone. Furthermore, lime-sulphur alone will kill only a small percentage of the newly hatched nymphs if they have made their appearance. Therefore, a com-

bined spray is better, for it will kill a greater percentage of eggs and all the nymphs. The time of application is important."

The best results can be obtained "by delaying the dormant spray until the fruit buds start to swell and when they first show green. At this stage the eggs of the oat aphis (*A. avenæ*) will be hatching, while the eggs of the rosy aphis (*A. sorbi*) and the green apple aphis (*A. pomi*) will not hatch for 7 to 14 days later. The dormant spray will not injure swollen fruit buds or those showing short projecting tips of leaves, while a dormant spray applied when the leaves are distinct and separated will burn the foliage of most varieties. Also, the recently emerged nymphs of the aphids will conceal themselves to a large extent between the separated leaves, and it will be impossible to hit all of them with a contact spray."

**Vegetable plant lice**, T. J. Headlee, (*New Jersey Stas. Circ. 107 (1919), pp. 3–21, figs. 16*).—This is a popular summary of information on the more important aphid enemies of vegetables in New Jersey. Of the 94 species recognized as affecting various plants within the limits of the State 12 are known as enemies of vegetable crops of which 7, known to be seriously and at times severely injurious, are here considered, namely, the pink and green aphis of the potato (*Macrosiphum solanifolii*), the green peach aphis, the green pea louse (*M. pisi*), the bean louse (*Aphis rumicis*), the cabbage aphis, the false cabbage aphis (*A. psudobrassicæ*), and the melon aphis.

**Control of plant lice or aphis**, F. H. Chittenden (*Potato Mag., 1 (1919), No. 11, pp. 10, figs. 3*).—A brief discussion of the plant lice that attack the potato, in which it is pointed out that the spinach aphis is commoner and more important than the pink and green aphid. The author recommends the use of nicotin sulphate (40 per cent) ⅜ pint, laundry or fish-oil soap 2 lbs., and water 50 gal.

**A Melaphis from moss**, A. C. Baker (*Ent. News, 30 (1919), No. 7, pp. 194–196, fig. 1*).—A species reared from moss found infested with an aphid at Springfield, W. Va., is described as *Melaphis minutus* n. sp.

**The identity of Smynthurodes betæ Westwood**, A. C. Baker (*Proc. Ent. Soc. Wash., 21 (1919), No. 2, pp. 36–38, fig. 1*).—The author concludes that *S. betæ*, described by Westwood in 1849, is distinct from our American beet aphid and that it should be known as *Forda betæ*.

**An undescribed species of Dryopea injurious to Phyllostachys**, A. C. Baker (*Proc. Ent. Soc. Wash., 21 (1919), No. 5, pp. 104–106, fig. 1*).—A plant louse found to attack the roots of Phyllostachys at Yarrow, Md., is described as *Dryopea morrisoni* n. sp.

**A report on a collection of Coccidæ from Argentina, with descriptions of apparently new species**, H. Morrison (*Proc. Ent. Soc. Wash., 21 (1919), No. 4, pp. 63–91, pls. 4*).—Twenty-one species of Coccidæ are here recorded from Argentina, of which 7 are described as new.

**Studies on the dry cleaning process as a means of destroying body lice**, R. H. Hutchison and W. D. Pierce (*Proc. Ent. Soc. Wash., 21 (1919), No. 1, pp. 8–20*).—"The open rotary washer system of dry cleaning, when done according to the specifications quoted, is entirely effective in destroying both the active stages and the eggs of body lice and has additional advantages in the cleansing of the garments and absence of shrinkage. The high temperature required in the drying tumbler was found to be essential for the destruction of the eggs. The wash and rinse in gasoline are effective in destroying active stages but a large percentage of the eggs will survive this part of the process. Gasoline itself is of no value as an ovicide; 18.7 per cent of the eggs in one test hatched after 54 hours' immersion in gasoline.

"An attempt to find a washing formula which of itself would be effective without depending on the high temperature of the drying tumbler was not successful, although results of one experiment with benzol, 30.5° B. indicated that the oil could be used for this purpose, if infested garments were soaked 2 to 4 hours before washing. A preliminary soaking in kerosene or in a 52° kerosene-gasoline mixture followed by washing in gasoline was found in laboratory tests to be ineffective.

"Laboratory tests with a series of oils showed that benzol (30.5°) killed after 2 to 4 hours' immersion; kerosene (44°) killed within 10 minutes; gasoline-kerosene mixtures (48 and 52°) killed after 15 minutes; a 56° mixture did not kill within 17 hours. Gasoline did not kill all eggs after 54 hours' immersion. When immersion in any of the heavier oils was followed by a rinse in gasoline hatching occurred. Gasoline-soap emulsion was found to have little killing effect on eggs even after 30 minutes' immersion."

**Notes on Diacrisia virginica.** J. D. MITCHELL (*Ent. News, 30 (1919), No. 7, pp. 191–194*).—The author reports observations made of the yellow bear caterpillar in Calhoun and Victoria Counties, Tex. In the summer of 1917, it was found feeding over all of Victoria County on various species of plants and shrubs, of which 36 are listed, and on cultivated plants, including cotton, corn, cantaloup, alfalfa, peanuts, and all garden crops.

The damage which it caused to cotton in the two counties in 1918 through stripping of the leaves is claimed by farmers to be from 25 per cent to total destruction, and in one field of 65 acres in Calhoun County visited by the author the destruction was complete.

In rearings by the author a large percentage of the caterpillars were destroyed by a fungus caused by *Entomophthora antica*. *Eremotylus arctior* was the only parasite reared. When very young the caterpillars can be killed by the application of 3 lbs. of Paris green and 5 lbs. of lime made into 50 gal. of spray, but when the caterpillars have reached a large size no poison or repellents seem to have any effect on them.

**The work in the United States against the pink bollworm.** W. D. HUNTER (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 166–175*).—A detailed account of the work by the U. S. Department of Agriculture, a bulletin relating to which by the author has previously been noted (E. S. R., 39, p. 764).

**The European corn borer and its control.** S. C. VINAL and D. J. CAFFREY (*Massachusetts Sta. Bul. 189 (1919), pp. 71, figs. 14*).—This is a detailed report based upon investigations conducted by the authors and a review of the literature, including data presented in the preliminary account by Vinal previously noted (E. S. R., 39, p. 62). The investigations reported in the present bulletin were conducted by the station in cooperation with the Bureau of Entomology of the U. S. Department of Agriculture.

Up to November, 1918, the European corn borer had become established in an area of about 320 square miles, comprising 34 towns, immediately west, north, and northwest of the city of Boston. A colony had also been found near Schenectady, N. Y., as noted by Felt (E. S. R., 41, p. 60). A list is given of 33 plants attacked of which corn is its favorite host, all parts except the fibrous roots being attacked.

"The economic injury to corn consists of the following: (1) Injury to tassel which results in poor fertilization, (2) injury to stalk which reduces vitality of plant, (3) injury to stalk which causes breaking over of plant, (4) injury to stalk which indirectly affects the ear by cutting off its supply of nutriment, (5) injury to ear which directly affects the yield, (6) injury to the silk of the ear which results in poor fertilization.

"A maximum of 117 full-grown European corn borer larvæ have been taken from one corn plant and 311 full-grown larvæ were dissected from a single hill of corn containing four plants. The average number of larvæ dissected from 75 corn plants, taken at random in the same field, was 46. This is at the rate of 1,050,640 larvæ per acre of corn. As many as 15 were found attacking a single ear of sweet corn. Field counts made in infested cornfields showed that frequently as high as 100 per cent of the ears were infested.

"The other economic plants mentioned as hosts of the European corn borer are attacked by the insect only in the absence of corn, or as a result of their nearness to corn in badly infested fields. The wild plants mentioned as hosts of the insect, are attacked only in the absence of corn, and are not economically important except that they serve as intermediate hosts for the multiplication of the pest.

"There are two generations of the insect each year. The nearly full-grown second generation larvæ pass the winter in a dormant condition within their tunnels, and resume feeding with the approach of warm weather in the spring. They pupate about the middle of May. The pupal period lasts about 17 days, and moths emerge the first week of June to deposit eggs for the first generation. A maximum number of 727 eggs was deposited by a single second generation female in life history cages, and the average number deposited by a single female was 337 eggs. These eggs are deposited in masses from 5 to about 50 eggs, on the undersides of the leaves of the host plant. The first generation larvæ hatch in about 7 days and reach their full growth in about 44 days. They pupate within their larval tunnels, and the pupal period lasts about 9 days. The moths emerge about the middle of July and deposit eggs for the second generation. A maximum number of 903 eggs was deposited by a single first generation female in life history cages, with an average number per female of 545 eggs. The second generation larvæ hatch in about 6 days and are nearly full grown by winter."

The natural enemies mentioned include four tachinid parasites, namely, *Masicera myoidea*, *Exorista pyste*, *E. nigripalpis*, and *Phorocera erecta*, reared from the larvæ, and two hymenopterous parasites, namely, (*Pimpla*) *Epiurus pterophori* and (*Ichneumon*) *Amblyteles brevicinctor*, from the pupæ. The percentage of parasitism by any of these species is very small.

"Burning the plants containing the overwintering larvæ, any time during the period from the middle of October to the middle of the next May, is the most effective control method now known. Other methods, applicable under certain conditions, for destroying infested plants are placing in manure or compost, in a silo, burying deeply in the soil, or feeding directly to live stock, preferably shredded or chopped fine."

**The European corn borer problem**, D. J. Caffrey (*Jour. Econ. Ent., 12 (1919), No. 1, pp. 92–105*).—This account is based upon data presented in the bulletin above noted.

**The European corn borer: A menace to the country's corn crop**, D. J. Caffrey (*U. S. Dept. Agr., Farmers' Bul. 1046 (1919), pp. 28, figs. 17*).—This is a popular summary of information based on the investigations reported in the bulletin noted above.

**A new species of Bucculatrix injurious to hollyhock**, A. Busck (*Proc. Ent. Soc. Wash., 21 (1919), No. 5, pp. 109, 110*).—*Bucculatrix althæa*, which appears to do considerable damage to hollyhock in California by skeletonizing the leaves, is described as new.

**Two Microlepidoptera injurious to strawberry**, A. Busck (*Proc. Ent. Soc. Wash., 21 (1919), No. 3, pp. 52, 53*).—*Tortricodes fragariana*, which breeds

commonly in the buds at the head of the crowns of strawberry, and *Aristotelia fragariæ*, the so-called strawberry crown borer, both taken at Victoria, B. C., are described as new.

**On some generic synonymy in the family Gelechiidæ**, A. Busck (*Proc. Ent. Soc. Wash., 21 (1919), No. 4, pp. 94–96*).—Attention is called to the fact that Pectinophora Busck may prove to be a synonym of Platyedra Meyrick erected in 1895.

**Descriptions of new species of Coleophora**, A. F. Braun (*Ent. News, 30 (1919), Nos. 4, pp. 108–112; 5, pp. 127–131*).—Among the species of Coleophora reared by the author at Cincinnati, Ohio, and here described are *C. apicella* n. sp., the larval cases of which are found on the lower side of the rosette leaves of the fire pink (*Silene virginica*); *C. polemoniella* n. sp., the larvæ of which feed on the lower side of leaves of Greek valerian (*Polemonium reptans*); *C. ericoides* n. sp., the larvæ of which mine the seeds and receptacle of a wild white aster (*Aster ericoides*); *C. amaranthella* n. sp., reared from larvæ eating out of the seeds of pigweed (*Amaranthus hybridus;* and *C. granifera* n. sp., the cases of which are found on the underside of leaves of *Aster shortii*.

**Notes on the California oak worm, Phryganidia californica**, H. E. Burke (*Proc. Ent. Soc. Wash., 21 (1919), No. 6, pp. 124, 125*).

**Nicotin sulphate solution as a control for the chrysanthemum gall midge, Diarthronomyia hypogæa**, T. L. Guyton (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 162–165, pl. 1*).—The author concludes that *D. hypogæ* can be successfully controlled at the time of the emergence of the adult by spraying with a solution of one volume of nicotin sulphate containing 40 per cent nicotin to 500 volumes of water, to which fish-oil soap has been added at the rate of 1 oz. to each gallon of solution. The plants must be completely covered with the spray solution, and since all adults do not emerge at the same time the treatment must be repeated every four or five days as long as any living forms of the midge remain in the galls.

**Observations on and experiments with Cuterebra tenebrosa**, R. R. Parker and R. W. Wells (*Jour. Parasitology, 5 (1919), No. 3, pp. 100–104, pl. 1*).—This is a report of observations and experiments conducted in Powder River Valley, Mont., in 1916 on the rodent botfly (*C. tenebrosa*) during the course of investigations of the Rocky Mountain spotted fever tick.

Under natural conditions the larvæ of this oestrid parasite were found infesting pack rats and grasshopper mice. Prairie dogs were infested under laboratory conditions, but negative results were secured with Belgian hares and 13-striped ground squirrels.

"A female deposited 186 eggs within a period of several days. These eggs contained active larvæ which were still alive after six months in the laboratory. By mechanically transferring larvæ from eggs to the mouths of prairie dogs infestation was secured. In three experiments with these animals (experiment 2 excluded because the host was killed) 20 larvæ were used, of which 11 reached the subcutaneous tissue, 5 died in this situation, and 6 emerged as fully matured larvæ. (One of these was dissected out just as it was completing the last molt.) Evidence that the larvæ had reached the subcutaneous tissue was found on the twelfth day in two instances, and within maximum limits of 9 and 10 days in two other experiments.

"The length of time elapsing after the first apparent evidence of larvæ under the skin and before the skin was punctured was about 2 days. The period spent in the subcutaneous tissue was 17, 25, 26, and 27 days in the several cases observed. The total period from infestation to the emergence of the fully de-

veloped larva was, respectively, 37, 38, and 47 days in three instances. After emergence from the host the mature larva entered the ground and soon pupated a few inches below the surface. The period between the emergence of the mature larvæ from the host and that of the fly was 47 days (June to August) in one instance and 173 days in another (July to January 8). Winter apparently may be passed in the pupal stage."

Notes on Phlebotomus species attacking man, D. C. Parman (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 211–213*).—These notes relate to attacks by *P. vexator* at Uvalde, Tex.

A new genus in Scatophagidæ, C. T. Greene (*Proc. Ent. Soc. Wash., 21 (1919), No. 6, pp. 126–129, fig. 1*).—*Amhopogon hyperboreus* n. g. and n. sp. is described.

The dispersion of flies by flight, F. C. Bishopp and E. W. Laake (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 210, 211*).—In extensive tests made by the authors in 1918 of the dispersion tendency of various species of flies, 60,000 colored flies were liberated at one point and 80,000 at another. The greatest distance from the point of liberation at which marked flies were recovered was for house flies 13 miles, screw worm flies 15 miles, *Phormia regina* 11 miles, and *Ophyra leucostoma* 7 miles.

A new root maggot treatment, E. B. Stookey (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 219, 220*).—In experiments at the Western Washington substation at Puyallup anthracene oil treated soil, scattered about the base of the plant to form a protecting collar, and 1 gal. of the mixture used to about 200 plants, gave quite satisfactory results.

Some notes on Phorbia fusciceps as a bean pest, I. M. Hawley (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 203–205, pl. 1*).—A brief account of the seed-corn maggot, which was the source of serious injury to the bean crop in New York State in the spring of 1917.

Two new genera of Anthomyidæ, J. M. Aldrich (*Proc. Ent. Soc. Wash., 21 (1919), No. 5, pp. 106–109, fig. 1*).—Two new genera, Pergandea and Sphenomyia, are erected.

A new genus and species of Cerambycidæ from Colorado, W. S. Fisher (*Proc Ent. Soc. Wash., 21 (1919), No. 2, pp. 38–40*).—*Elatotrypes hoferi* n. g. and n. sp. was collected from under bark of a dead limb of a partially dead limber pine (*Pinus flexilis*) at Ute Pass, El Paso County, Colo.

Descriptions of a new genus and species of Buprestidæ from Arizona, W. S. Fisher (*Proc. Ent. Soc. Wash., 21 (1919), No. 4, pp. 91–93*).—The genus Paratyndaris is erected for *P. coursetiæ*, a new species reared from pupæ collected in dead stems of a legume (*Dourseti microphylla*) in Tucker Canyon, Santa Catalina Mountains, Ariz.

Note on Macrobasis murina, W. S. Fisher (*Proc. Ent. Soc. Wash., 21 (1919), No. 1, pp. 1, 2*).—This meloid is said to have proved to be a serious menace to the pea tree (*Caragana* sp.) at Mandan, N. Dak., where the tree has been introduced for ornamental purposes.

The striped cucumber beetle and its control, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 1038 (1919), pp. 20, figs. 15*).—A popular summary of information on this pest with directions for its control.

Injury from white grubs in Iowa, E. D. Ball and E. V. Walter (*Iowa Sta. Circ. 60, pp. 4, figs. 2*).—A popular summary of information on white grubs, serious outbreaks of which have occurred in northeastern Iowa during the past ten years.

Notes on a cocoon making colydiid, H. E. Burke (*Proc. Ent. Soc. Wash., 21 (1919), No. 6, pp. 123, 124*).—These notes relate to *Deretaphrus oregonensis*.

Eleodes opaca, an important enemy of wheat in the Great Plains area, J. W. McColloch (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 183–194, pl. 1*).—The life history of the false wireworm (*E. opaca*), an insect which is becoming of increasing importance, having caused considerable injury in western Kansas and southwestern Nebraska, has been worked out by the author and is here reported upon.

This species has a wide distribution throughout the Great Plains area, occurring from Texas to South Dakota. Its principal injury is caused by the larvæ during the fall, at which time they attack the wheat seed immediately after planting and destroy it before germination. After the seed germinates the injury becomes less noticeable and often ceases altogether. In some cases, however, considerable damage may occur after the wheat is several inches high. Occasionally some damage occurs in the spring due to the larvæ burrowing through the stalks or even cutting them off. In addition to wheat the worms have been reared on sprouting corn, foxtail seeds, and crabgrass roots.

The eggs deposited during midsummer hatch in from 6 to 10 days, while later in the fall the period is prolonged to 19 days. The first oviposition recorded occurred on July 5 and the last on October 4. The larvæ which molt 11 times between hatching and pupation require for each stadium 4, 3, 4, 6, 8, 13, 15, 12, 18, 199, and 20 days, respectively, or an average total of 317.7 days for larval development, based on 50 larvæ, extending over a period of 3 years. Most of the larvæ become full-grown by October, in which stage they pass the winter, become active in early spring, and usually molt once in April. Pupation occurs during the last of April and throughout the month of May, 14.1 days being the average length of the pupal stage, based upon observations of 149 pupæ observed during a period of 4 years. The adults commence to emerge about the middle of May and continue through June, the adults being found in the field until the middle of October, the greatest number being present in July and early August. Most of the adults under observation lived from 60 to 90 days and 1 male lived 130 days.

Three generations have been reared by the author from adults collected in the field in 1915, 341.5 days being the average period required for each brood, based upon the average length of the various stages.

The hymenopterous parasite *Perilitus eleodis* has been reared each year from a few beetles, and a gregarine (*Stylocephalus giganteus*) has frequently been found in the alimentary tract of the adults. Two species of fungi have been found attacking the larvæ, namely, *Sporotrichum globuliferum* and *Metarrhizium* sp.

While no extensive control experiments in the field have been carried out, the author's studies suggest several promising methods of procedure which have proved beneficial in controlling *E. opaca* or reducing the amount of injury. The investigations show that in nearly all cases the greatest injury occurred on land continuously cropped to wheat, while fields that have been in a row crop or fallowed previous to wheat have suffered little damage. The rotation suggested for western Kansas is wheat 2 years, Kafir or other sorghums 1 year, and summer fallow 1 year.

A list is given of 11 references to the literature cited.

Avocado seed weevils, H. S. Barber (*Proc. Ent. Soc. Wash., 21 (1919), No. 3, pp. 53–60, pl. 1*).—An avocado weevil, distinct in habitus from *Heilipus lauri* and described as *H. pittieri* n. sp., was taken at Washington, D. C., from seeds of *Persea pittieri* from San Jose, Costa Rica. *Conotrachelus perseæ*, reared from avocado seed from Coban and Guatemala City, Guatemala, is also described as new. Several other insects reared from seeds of the avocado are also considered.

**Contributions to our knowledge of the weevils of the superfamily Curculionoidea**, W. D. PIERCE (*Proc. Ent. Soc. Wash., 21 (1919), No. 2, pp. 21–36*).

**[Apicultural work]** (*Iowa Sta. Rpt. 1918, pp. 31, 32*).—In tests of the comparative yield of honey from 1-, 2-, and 3-lb. packages of bees shipped from the South, the 1-lb packages gained 12 lbs. during the season, the 2-lb. packages, 39 lbs., and the 3-lb packages, 45 lbs., while the average gain from overwintered swarms was 59 lbs. In a study of the cost of wintering bees, it was found that each colony consumed about 17 lbs. of stores from October to April, inclusive. Careful measurements of a large number of bees from the best and from the poorest colonies showed the average length of the tongues of the highest producing colony to be 4 per cent greater than that of the lowest producing one, and this variation was found to be quite consistent.

**The clover seed chalcid (Bruchophagus funebris)**, W. WILLIAMSON (*Rpt. State Ent. Minn., 17 (1918), pp. 95–110, figs. 10*).—A report of this pest, based upon investigations in Minnesota, where it appears to be present wherever clover is grown. The greatest amount of damage to clover seed recorded in Minnesota is 39 per cent.

**New genera and species of ichneumon flies**, R. A. CUSHMAN (*Proc. Ent. Soc. Wash., 21 (1919), No. 5, pp. 112–120, fig. 1*).—This paper contains descriptions of three new genera, namely, Derocentrus, Cyrtobasis, and Atopognathus, three new species, and a new variety of the Ichneumonidæ and one new braconid species. Among the new forms are *Hyposoter fugitivus pacificus* from *Malacosoma plurialis* and *M. ambisimillis* from Tacoma, Wash., and several localities in California, and *Apanteles iselyi* from *Canarsia hammondi* at Bentonville, Ark.

**A new genus of chalcid wasp belonging to the family Eulophidæ**, A. B. GAHAN (*Proc. Ent. Soc. Wash., 21 (1919), No. 1, pp. 2–8, fig. 1*).—The genus Apterolophus is erected for *A. pulchricornis* n. sp., thought to be parasitic on the larva of *Epargyceus tityrus*.

**Parasite introduction as a means of saving sugar**, T. E. HOLLOWAY (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 175–178*).—A brief account of the introduction of parasites (*Euzenilliopsis diatrææ, Bassus stigmaterus*, and *Apanteles* sp.) for the control of *Diatræa saccharalis*, based upon data presented in the bulletin previously noted (E. S. R., 41, p. 60).

**A new species of the serphidoid genus Dendrocerus**, A. B. GAHAN (*Proc. Ent. Soc. Wash., 21 (1919), No. 6, pp. 121–123*).—*Dendrocerus conwentziæ* reared from *Conwentzia hageni* at Amherst, Mass., and *D. conwentziæ rufus* from cocoons of *Conwentzia* sp., at Felida, Wash., are described as new.

**Description of a new cynipoid from Trinidad**, S. A. ROHWER (*Proc. Ent. Soc. Wash., 21 (1919), No. 6, p. 156*).—*Diglyphosema anastrephæ* reared from *Anastrepha* sp., Trinidad, British West Indies, is described as new.

## FOODS—HUMAN NUTRITION.

**The nutritive value of the wheat kernel and its milling products**, T. B. OSBORNE, L. B. MENDEL ET AL. (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 557–601, pls. 11, figs. 3*).—A detailed study is presented of the composition and nutritive value of the wheat kernel and its milling products, with special reference to the problems raised by modern milling methods and the degree to which it is desirable to mill flour for general use. The literature on the composition of the embryo, seed coats or bran, endosperms, and whole wheat kernel is reviewed, and data compiled from the literature and from original studies are presented.

The principal experimental work reported is an extensive series of investigations on rats for the purpose of comparing quantitatively the entire wheat

kernel and its milling products with respect to the nutritive value of their proteins and their content of water-soluble vitamin, both for the maintenance of adult rats and the growth of young ones. The results of these studies may be summarized as follows:

The proteins of the wheat kernel are not greatly inferior for maintenance to casein, or even the total proteins of milk, and are superior to gliadin. They suffice to promote growth of rats to normal adult size, but the quantity of protein required for growth is relatively large. The crude protein of commercial embryo meal is apparently more efficient than that of the entire wheat kernel for maintenance and much more efficient for growth. The crude protein of wheat bran has a higher value for growing animals than that of the embryo, and is quite as efficient as that of a combination of wheat flour with eggs, milk, or meat. This would indicate that the farmer is justified in his high estimate of the value of wheat bran as a protein concentrate.

The proteins of the endosperm are adequate for maintenance of adults, but inadequate for growth even when liberal quantities are eaten. A diet containing only 10.3 per cent of protein furnished by flour supplemented with eggs, milk, or meat produced more rapid growth than when it contained even 50 per cent more protein derived entirely from wheat flour. This shows that under the ordinary human dietary conditions the proteins of wheat are advantageously employed.

Commercial wheat embryo is much richer in the water-soluble vitamin than commercial bran and flour. The pure embryo, carefully separated from all the other parts of the seed and used as the sole source of vitamin, suffices to maintain young rats but fails to promote their growth. Wheat kernels from which the embryo has been carefully removed are still rich in water-soluble vitamin. From these observations the question is raised as to whether the water-soluble vitamin is a single substance or a mixture of two or more. If it is a single substance it is considered that it must be a constituent of the endosperm.

Rats fed for one year from the time of weaning on diets containing 92 per cent of wheat or 50 per cent of commercial wheat embryo reached full maturity without giving any evidence that wheat contains a toxic substance.

In applying these results to the question of the extent to which wheat should be milled, the authors conclude that, except in special cases, little can be gained by including bran and embryo in the flour when it is used for human consumption under the conditions prevailing in this country. On the contrary, since the rations of farm animals require protein supplements and wheat bran is a valuable source of such proteins, the by-products of milling will be better utilized on the farm than on the table. Moreover, since "about 80 per cent of the wheat kernel can be so improved in nutritive value by adding animal products to the diet that a much smaller amount of flour will satisfy the protein needs of nutrition, it may well be that the use of the by-products of milling for the production of meat, milk, or eggs will result in a greater economy in the use of flour than if these were used directly for human food."

**Studies in nutrition.—I, The nutritive value of coconut globulin and coconut press cake**, C. O. Johns, A. J. Finks, and M. S. Paul (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 497–502, figs. 4*).—Feeding experiments with rats to determine the nutritive value of coconut globulin and coconut press cake, the composition of which has been previously noted (E. S. R., 40, p. 502), are reported which indicate that coconut globulin produces normal growth when used as the sole source of protein in an otherwise complete diet, and that commercial coconut press cake furnishes the necessary protein for growth at almost a

normal rate. The press cake was found to contain sufficient water-soluble vitamin and some fat-soluble vitamin, but the rate of growth was increased by adding butter fat to the diet. Preliminary experiments indicated that the press cake is deficient in inorganic constituents, probably calcium, phosphorus, and chlorin.

**Baker's yeast as food for man,** P. B. Hawk, C. A. Smith, and R. C. Holder (*Amer. Jour. Physiol., 48 (1919), No. 2, pp. 199–210*).—Metabolism experiments upon man are reported in which the value of baker's yeast was studied, first when added to a high protein diet defective in lacking the water-soluble vitamin, second, when added to a low protein defective diet, and third, when used to replace varying amounts of protein in a normal diet. The yeast (Fleischmann) was in most cases dried at 105° C. in a current of air, milled to produce a yeast flour of the approximate fineness of ordinary wheat flour, and then made into biscuits with wheat flour. As much as 20 per cent of the wheat flour could be substituted by the yeast flour without destroying the palatability of the product. A palatable mixture could also be made from the undried yeast with chopped meat.

Of the six men who served as subjects, four found the diet more satisfactory when yeast was included as shown by an improved nitrogen balance. The average daily gain of nitrogen in all the experimental periods when no yeast was present in the diet was 0.48 gm., while this gain was increased to 0.82 gm. when yeast was eaten along with other foods. It was found that from 10 to 30 per cent of the nitrogen of the ordinary mixed diet may be replaced by yeast nitrogen without detriment to the best nutritive interests of the individual. The average individual may ingest yeast sufficient to yield from 1 to 2 gm. of nitrogen per day without securing any laxative effect, but if as much as 4 gm. of yeast nitrogen are eaten a laxative effect is generally observed.

The favorable results obtained in these experiments are compared with the opposite conclusions of Funk et al. (E. S. R., 36, p. 158), and factors to account for the difference are suggested.

**Note on an indigenous process for the conservation of meat at Fez,** Carpentier (*Rec. Méd. Vét., 95 (1919), No. 5, pp. 149–156*).—An indigenous method of preserving meat, particularly beef, in Morocco is described. The sterilization of the meat is obtained by the triple action of salt, desiccation, and heat, and external contamination is avoided by a covering of fat. Attention is called to the fact that the method combines almost all of the known processes for the conservation of meat.

**Military soups and porridges,** Balland (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 8, pp. 383–386*).—Analyses are reported of several varieties of dried, or so-called instantaneous, soup preparations and soup extracts used by the French and German armies.

**French table mustards,** P. Carles (*Ann. Falsif., 11 (1918), No. 119–120, pp. 310–316*).—Analyses are reported of 11 samples of prepared French mustards, some of the results of which are given in the following table:

*Analyses of mustards.*

| Analysis. | Moisture. | Residue. | Total ash. | Sodium chlorid. | Mustard oil. | Total acidity as acetic acid. |
|---|---|---|---|---|---|---|
| | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* |
| Minimum | 62.50 | 21.20 | 2.50 | 0.66 | 0.056 | 1.84 |
| Maximum | 75.00 | 41.00 | 11.30 | 7.30 | .257 | 4.80 |
| Average | 67.00 | 31.40 | 5.39 | 3.31 | .13 | 3.74 |

The author is of the opinion that a prepared mustard should contain at least 5 per cent of sodium chlorid and 0.1 per cent of mustard oil.

**Nutritive value of food**, H. ARON (*Biochem. Ztschr., 92 (1918), No. 3–4, pp. 211–233, figs. 12*).—This is a general discussion of the various factors other than calorific value which must be taken into consideration in determining the real value of food materials. The importance of butter fat and of vegetable extracts is emphasized particularly.

**Studies on bacterial nutrition.—The utilization of nitrogenous compounds of definite chemical composition**, S. A. KOSER and L. F. RETTGER (*Jour. Infect. Diseases, 24 (1919), No. 4, pp. 301–321*).—An extensive review of the literature on bacterial nutrition is given, and results are reported of an investigation of the ability of various species of bacteria to utilize the simpler nitrogenous substances of known chemical structure, such as amino acids, purins, and extractives, and combinations of these substances.

All of the amino acids employed, with the possible exception of tryptophan, showed similar ability to furnish nitrogen to certain organisms. Tryptophan appeared to possess a slight advantage over the other amino acids but, contrary to expectation, lysin showed no greater power than the monamino acids. The organisms which were able to develop on an amino acid medium appeared to require only small amounts of the amino acid. When only a few hundred cells were introduced into the amino acid culture medium multiplication took place as usual, and eventually the growth attained was as luxuriant as that resulting from a much larger inoculation. This is thought to indicate that some organisms are able to assimilate the amino acid nitrogen without the aid of enzym action. When glycerol was withdrawn from the medium, the bacterial development was not so luxuriant but dextrose could be substituted for glycerol.

With the exception of the cholera vibrio, the organisms which utilize an amino acid developed with equal readiness on diammonium acid phosphate and on allantoin. Urea, taurin, creatin, hypoxanthin, and uric acid were inferior to the amino acids as available sources of nitrogen. Combinations of amino acids or of amino acids and other nitrogen-containing compounds appeared to possess little value over any one of the single amino acids.

*Bacillus anthracis*, *Proteus zenkeri*, *B. abortus*, *B. diphtheriæ*, *B. hoffmanni*, *B. dysenteriæ*, and all of the cocci studied, with the exception of *Sarcina lutea* in a few cases, consistently failed to develop in all of the media employed. *Bacterium pullorum* developed slightly in one instance only, while *B. typhosus* exhibited a slight growth in a few mediums.

Suggestions offered as to the probable nature of the nitrogenous bodies required by these species for initial development are dipeptids or polypeptids, vitamins, and simple and unstable bodies which defy all known methods of isolation.

**The pathogenesis of deficiency disease**, R. MCCARRISON (*Indian Jour. Med. Research, 6 (1919), No. 3, pp. 275–355, figs. 22*).—This article consists of the report of an extensive study of clinical, anatomical, and histological findings in pigeons subjected to dietetic deficiency. The paper is divided into three parts, (1) the effects of inanition alone, (2) the effects of a milled and autoclaved rice dietary alone, and (3) the effects of this dietary in association with septicemic states.

Six pigeons deprived of all food with the exception of water died in an average period of 12 days, with an average loss of 23 per cent of their original body weight. The thymus, testicles, spleen, ovary, and pancreas were found

to have undergone atrophy in the order mentioned. The adrenals underwent hypertrophy with increase of their adrenalin content.

The effects of a sole diet of milled and autoclaved rice were studied in 34 pigeons whose heart's blood and organs were demonstrated to have been sterile at the time of death. Of these, three types of morbid state were recognized clinically: Seventeen cases in which cerebellar symptoms predominated, 9 cases of polyneuritis without cerebellar symptoms, and 8 cases of pronounced asthenia. The average loss in weight was about 33 per cent of the original weight. The pituitary glands were found unchanged, the adrenals had undergone marked hypertrophy, while the thymus, testicles, spleen, ovary, pancreas, heart, liver, thyroid, kidney, and brain had atrophied. The central nervous system underwent little atrophy, the paralytic symptoms being due mainly to impaired functional activity of the nerve cells rather than to their degeneration.

The most remarkable finding is considered to be the hypertrophy of the adrenals, which is thought to be due to a want of vitaminic substance. The similarity is pointed out between this phenomenon and the hypertrophy of the thyroid for want of iodin. An intimate and causal connection is thought to exist between the hypertrophy of the adrenals and the origin of edema, in both inanition and beriberi, wet beriberi and dry beriberi being essentially the same disease but differing in the degree of derangement of the adrenal glands.

Another significant finding is the constant and pronounced atrophy of the testicles in males and the similar but less pronounced atrophy of the ovary in females. In the human subject such degrees of atrophy would result in sterility in males and amenorrhea and sterility in females. The finding is thought to account in great measure for the occurrence of "war amenorrhea."

The study of the relation between infection and deficiency disease was conducted on pigeons naturally and artificially infected with *Bacillus suipestifer*. Preliminary accounts of these studies have been previously noted (E. S. R., 32, p. 563). The general results obtained were as follows:

Infected birds when fed on polished rice developed symptoms of polyneuritis more rapidly than noninfected birds. Asthenic and fulminatory forms of polyneuritis were much more frequent in infected birds, which rarely survived long enough to develop cerebellar symptoms. This type, however, developed in birds in which infection had been prevented by isolation and immunization. Control birds fed on a liberal diet of mixed grains were in general immune, although exposed to infection. These results are thought to illustrate the influence which infectious agencies probably exert in man under like conditions of dietetic deficiency. It is pointed out that in nature beriberi arises in communities subjected to the attack of innumerable bacterial and other parasitic agencies, to which they are rendered highly susceptible in consequence of the dietetic deficiency. A tabular comparison of the anatomical findings in avian and human beriberi illustrates further the resemblance between the two diseases.

In conclusion the author points out that as the absence from the dietary of the so-called antineuritic food factors has been shown to lead not only to functional and degenerative changes in the central nervous system but to similar changes in every organ and tissue of the body, the condition produced is not a neuritis. "The symptom-complex is due (a) to chronic inanition, (b) to derangement of function of the organs of digestion and assimilation, (c) to disordered endocrine function especially of the adrenal glands, and (d) to malnutrition of the nervous system."

The term "antineuritic vitamins" as applied to the food factors, the lack of which is the essential cause of beriberi, is therefore considered inaccurate, and the name "nucleopast" (that which feeds the nucleus) is suggested as more appropriate.

**Factors affecting the antiscorbutic value of foods**, A. F. HESS and L. J. UNGER (*Amer. Jour. Diseases Children, 17 (1919), No. 4, pp. 221–240, figs. 2*).—In continuation of the series of papers on human scurvy (E. S. R., 40, p. 70), the authors have reviewed the available reports on the occurrence of scurvy in the troops and in civilian populations during the war, and have summarized recent data in regard to the antiscorbutic value of fresh, pasteurized, and dried milk, and fruits and vegetables.

The significance is noted of the measures instituted by the British Government for the prevention of scurvy, including the maintenance of vegetable gardens in Mesopotamia and a change in the dietary scale involving an increase in the amount of vegetables ordered for the British troops in India.

In discussing the possible deficiency in antiscorbutic vitamin of pasteurized and dried milk, it is pointed out that much of the antiscorbutic factor is lost subsequent to heating in the course of the handling and aging of the milk, and that "in connection with the effect of aging, of alkalinization, of heating, and probably of other agencies deleterious to this 'vitamin,' the length of time to which it is subjected to the injurious environment is in general more important than the intensity of the process." This is thought to apply also to the dehydration of vegetables. In dehydration "too much attention has been paid to the degree of the heating process, and too little to the more important factors—the age of the vegetables, their freshness previous to dehydration, their manner of preservation, etc."

Clinical reports are given indicating that diuresis and catharsis do not play an important rôle in the cure of scurvy, and that consequently the disorder can not be essentially toxic in nature. It was found also that giving an antiseptic (sodium benzoate) was without effect.

The strained juice of canned tomatoes has been found to be a very effective antiscorbutic and to be well tolerated by babies a few weeks of age, and is therefore recommended as an inexpensive and practical addition to the dietary of the bottle-fed infant.

**The effect of heat, age, and reaction on the antiscorbutic potency of vegetables**, A. F. HESS and L. J. UNGER (*Proc. Soc. Expt. Biol. and Med., 16 (1919), No. 4, pp. 52, 53*).—In continuation of experiments on antiscorbutics previously noted (E. S. R., 39, p. 771), the authors report a slight difference in the antiscorbutic properties of old and fresh carrots. It was found that while 35 gm. of old carrots were sufficient to protect a guinea pig from scurvy when used raw, after cooking for three-quarters of an hour their addition to the dietary proved insufficient for protection. In a parallel test with freshly-plucked carrots, 35 gm. proved a sufficient protection even after cooking. It is pointed out that, in a consideration of vegetables as foodstuffs, account must be taken of the factor of freshness, particularly as older vegetables are tougher and therefore require more prolonged cooking, thus lessening their antiscorbutic value still further.

Attention is called to the fact that the antiscorbutic value of canned tomatoes is slightly diminished by boiling, so that they should not be subjected to cooking when employed as an antiscorbutic for infants. Their efficacy is not diminished immediately by rendering them slightly alkaline to phenolphthalein, but neither tomato nor orange juice will retain antiscorbutic properties long after having been rendered alkaline.

**Is vitamin identical with secretin?** B. C. P. Jansen (*Mededel. Genees. Lab. Weltevreden [Dutch East Indies], 3. Ser. A, No. 1–2 (1918), pp. 99–104*).—To determine whether the water-soluble vitamin is of the nature of secretin, its stimulating effect upon the secretion of pancreatic juice of dogs was tested by the temporary fistula method. While repeated secretin injections caused repeated secretion of the juice the vitamin, in the form of a water solution of an alcoholic extract of rice bran, had no perceptible effect. The conclusion is therefore drawn that the water-soluble vitamin is not identical with secretin.

**The presence of calcium in the red blood corpuscles of ox and man.** D. M. Cowie and H. A. Calhoun (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 505–509*).—By the use, with slight modifications, of the Lyman method for the determination of calcium in blood (E. S. R., 37, p. 207), the red blood corpuscles of men and of oxen were found to contain calcium, but in somewhat smaller concentration than the serum.

## ANIMAL PRODUCTION.

**Scientific principles applied to breeding.** S. Wright (*Breeder's Gaz., 75 (1919), No. 8, pp. 401, 402*).—The importance of the more modern concepts of heredity in clearing away mystical beliefs and their service in interpreting the complicated facts of animal improvement are briefly set forth in this paper, and a modest claim made for genetics as a useful guide in modifying current practices. A short statement is presented of some results of the inbreeding experiments of the Bureau of Animal Industry of the U. S. Department of Agriculture which are now being conducted by the author. In these experiments, which involve over 26,000 guinea pigs, a number of families have been maintained for 19 generations without any very obvious degeneration.

"There has been, however, some decline in constitutional vigor, size, and especially fertility. On crossing together inbred families there is marked improvement in all respects, suggesting that the different families have usually deteriorated for different reasons, [thus] enabling each parent in a cross to supply most of what the other lacks. The detailed study of the separate families bears out this view. Marked hereditary differences in average vitality, size, fertility, and the like are in fact characteristic of the different families. It is also found that vigor in one respect is as likely as not to be associated with weakness in another. Again, certain families remained practically constant in average vigor throughout the experiment, while others degenerated so rapidly in one or more respects that they became extinct in spite of all efforts to keep them going."

**Applications of mathematics to breeding problems, II.** R. B. Robbins (*Genetics, 3 (1918), No. 1, pp. 73–92*).—Continuing his studies (E. S. R., 38, p. 367) of the theoretical distribution of Mendelian characters in successive generations of an ideal population, the author in the first section of the present paper investigates a single sex-linked character under (1) random mating, (2) assortative mating, (3) brother and sister mating, both at random and assortative, and (4) parent and offspring mating. In the second section he deals with a single typical factor when offspring are systematically bred back to their parents. A large number of algebraic formulas are developed to express the theoretical conditions in any generation. The results are mainly generalizations of special cases discussed by Jennings (E. S. R., 34, p. 764).

**Some applications of mathematics to breeding problems, III.** R. B. Robbins (*Genetics, 3 (1918), No. 4, pp. 375–389*).—Extending the investigations

noted above by the inclusion of a second Mendelian character, the author studies by algebraic methods the behavior of two allelomorphic pairs, linked in any degree, under (1) random mating, (2) a type of selection in which the only zygotes allowed to breed are dominants with respect to one of the pairs, and (3) self-fertilization. The topics are among those discussed by Jennings (E. S. R., 38, p. 268), but with the use of neater methods much greater generality is secured.

In all three systems of breeding, the relative proportion of each kind of gamete approaches a definite limit as the number of generations increases, and under random mating these limits are independent of the degree of linkage. The formulas indicate clearly the conditions necessary for stability when mating is at random. As is the case with only a single factor, the heterozygous types tend to disappear under self-fertilization.

**Random mating with the exception of sister by brother mating,** R. B. ROBBINS (*Genetics, 3 (1918), No. 4, pp. 390–396*).—Theoretical study of the fate of a single Mendelian character in a population in which mating is at random, except that brother and sister mating does not occur, shows that as the number of generations increases the proportions of the three possible types of individuals approach a fixed limit. Constant number of offspring to a pair is assumed, and if this number be 3 or more the limits approached are found to be the same as those of standard random mating. If the number of offspring is 2, the proportion of heterozygotes in the limiting population is higher. In complete brother and sister mating, as the author has previously shown (E. S. R., 38, p. 367), the limit for heterozygotes is zero.

**Numerical effects of natural selection acting upon Mendelian characters,** H. C. WARREN (*Genetics, 2 (1917), No. 3, pp. 305–312*).—When only one pair of allelomorphs is considered, it is well established that the proportion of dominants to recessives in a population remains fixed after the first generation, provided mating is at random and there is neither differential fertility nor selective eliminations of one or the other class of individuals. This paper discusses the changes that occur when a type of selective elimination is admitted such that there is a constant relative difference in the juvenal death rates of the two classes. With the aid of H. S. Jennings, a general formula is derived.

For a given difference in death rates, it is found that if the higher rate is characteristic of the dominants their elimination takes place more rapidly than would the elimination of the recessives if the latter class were the less viable.

**The influence of the male on litter sizes,** E. N. WENTWORTH (*Proc. Iowa Acad. Sci., 24 (1917), pp. 305–308*).—Statistics are presented showing the average size of litters got by sires classified according to the size of litter in which they were born. Probable errors of the averages considered, no significant differences in the breeding performance of the different classes of sires of the same type of animal were apparent. The records include 9,026 Southdown rams, 415 Chester White boars, and 23 collie dogs. The rams in pedigrees started from single and from twin births are recorded separately.

The material was assembled mainly because Harris (E. S. R., 40, p. 662), in examining the litter frequencies reported by Wentworth and Aubel (E. S. R., 35, p. 68) for swine and by Rietz and Roberts (E. S. R., 34, p. 73) for sheep, found slight indications of an influence of sire on litter size.

**Inheritance of fertility in sheep,** E. N. WENTWORTH (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 243, 244*).—Data from the Southdown births mentioned above are tabulated, as in a paper previously noted (E. S. R., 38, p. 574), to show the relative influence of sire and dam on litter size. It is concluded that

the production of triplets requires an hereditary equipment on the part of the dam different from that sufficient to produce only one or two lambs at a birth.

Unpublished results of J. M. Evvard are cited to show that the rate at which ewes are growing at the time of mating influences the number of offspring produced.

**The Maoilin of Ireland**, S. L. Mitchell (*Hoard's Dairyman, 57 (1919), No. 11, p. 551*).—The Maoilin are dun-colored polled cattle constituting a very old breed, of which, however, only eight or nine herds are still in existence. A number of their skulls have been found in the crannogs of pre-Christian Ireland, and the author suggests that the polled character of some present-day Scotch and English breeds might have been derived from cattle taken to Scotland and East Anglia by early Irish colonists.

**Feminized male birds**, H. D. Goodale (*Genetics, 3 (1918), No. 3, pp. 276–299, figs. 10*).—This paper reports the successful retention of homoiotransplants of ovarian tissue by 10 Brown Leghorn capons and 3 castrated Gray Call drakes at the Massachusetts Experiment Station.

The operated cockerels resembled normal males in weight and body proportions and in spur development, and were surprisingly like males in their sexual behavior. However, the combs and wattles remained infantile, the combs when single developed a typical female droop, crowing was rare, and, with three partial exceptions, the plumage was entirely female in color and form, even to the details of barbule development. In the exceptions the feather length, in regions where the male has long feathers, somewhat exceeded that of typical females, and there were also color variations due, it is thought, to the fact that the stock was not pure bred but extracted from experimental crosses with White Plymouth Rocks. The first feminized cockerel described (E. S. R., 34, p. 870) was one of these exceptions.

The castrated drakes serving as hosts for duck ovaries developed duck-colored heads and had no white ring on the neck and no curl in the tail feathers. The other plumage characters resembled those of males, but the color was toned down. In two cases the quack was imperfect. It is stated that ordinary castrated drakes and spayed ducks always retain the typical voice of their own sex.

In one case an ovary was successfully engrafted in a cock from which one testicle only had been removed. The secondary sexual characters were unmodified. At autopsy the remaining testicle was found to be undersized, but motile spermatozoa were present.

These facts are discussed at some length with respect to theories of gonad secretion.

**The laws of bone architecture**, J. C. Koch (*Amer. Jour. Anat., 21 (1917), No. 2, pp. 177–293, pls. 5, figs. 23*).—This is an elaborate investigation of bone structure from the standpoint of analytical mechanics.

It is shown that the human femur, which was selected for study as a typical bone, obeys the mechanical laws that govern elastic beams under stress. The relation between the computed internal stresses due to load on the femur head and the internal structure of the different parts was found to be in very close agreement with the theoretical relations that should exist for the greatest economy and efficiency. The inner architecture is a mechanical model designed to produce the maximum strength with the least possible material.

**An experimental study of the effect of stress and strain on bone development**, J. A. Howell (*Anat. Rec., 13 (1917), No. 5, pp. 233–252, figs. 7*).—In a four weeks old fox-terrier dog the main nerves supplying the brachial plexus on

the right side were severed. This operation prevented voluntary movement of the right front leg but did not interfere with the blood supply. Contraction of the muscles controlling the upper arm served to hold the leg close to the body in a fixed position. The leg thus bore no weight and was subject only to slight muscular pull. Growth of the bone in the living animal was studied by means of radiographs. The subject was killed at the age of 23 weeks and a detailed comparison made of the bones of the two front limbs.

The long bones of the unused leg attained nearly the same length as those of the other side but the diameters were only about half as great, due to decrease both in the amount of bone tissue and in the size of the marrow cavity. The weight required to crush the bones of the operated limb was 14,845 lbs. per square inch of bone cross section, only 19 per cent less than that required for the normal bones. The unused shoulder blade was very thin and in places entirely membraneous.

The author concludes that bone development is not entirely controlled by the mechanical stresses to which it is subjected.

**Effects of inanition and refeeding upon the growth and structure of the hypophysis in the albino rat,** C. M. JACKSON (*Amer. Jour. Anat., 21 (1917), No. 2, pp. 321–358, figs. 5*).—The experiments reported here were undertaken because of the intimate relations that seem to exist between the pituitary body (hypophysis cerebri) and the general growth process. A total of 91 rats, young and adult, were used. The diet consisted of graham bread soaked in whole milk and was varied only as to amounts fed. After an experimental feeding period, the rats were killed and the body length, body weight, and weight of hypophysis determined. These data are tabulated for each individual. The volumes of the different parts of the hypophysis were estimated from serial sections.

During restricted feeding the relative proportions of parts were altered but, except after long periods of maintenance, there was a gradual return to normal upon refeeding. Cell division in the hypophysis generally ceased during underfeeding, but there was no evidence as far as this organ is concerned in favor of the suggestion of Osborne, Mendel, et al. (E. S. R., 34, p. 862) that accelerated growth following periods of suppression is due to specific histological changes in the ductless glands.

**Cytological studies of the reproductive cells of cattle** (*Idaho Sta. Rpt. 1918, p. 34*).—On the basis of an examination of the testes of a bull by J. E. Wodsedalek, it is stated that there are 37 chromosomes in the spermatogonia and that the unpaired one passes undivided to one pole at the first spermatocyte (reduction) division.

**Composition and nutritive value of feeding stuffs,** T. B. WOOD and E. T. HALNAN (*Cambridge, Eng.: Univ. Press [1918], pp. 24, figs. 6*).—This is a compilation in tabular form of proximate analyses of materials used by British farmers as feeding stuffs and of the available data as to digestible nutrients in each, together with a computation of the nutritive ratio, the maintenance and production starch equivalents, and the food units per ton. A series of charts gives curves showing the relation of food requirements to body weights in the different classes of live stock.

**The composition and food value of bracken rhizomes,** J. HENDRICK (*Scot. Jour. Agr., 1 (1918), No. 4, pp. 423–430*).—Proximate analyses of nine samples of fresh washed bracken rhizomes and one sample dried and ground to meal are presented, together with notes on the amounts to be secured from bracken-infested pastures, the cost of digging, and the preliminary results of the feeding trials noted below. It is stated that, in some cases at least, unringed pigs learn to root up the rhizomes and eat them.

**Report on experiments on the feeding value of bracken rhizomes for pigs and poultry** (*West of Scot, Agr. Col. Bul. 89 (1919), pp. 101–107*).—In a 20-weeks' trial reported by J. Wyllie, a lot of 6 pigs fed bracken rhizomes mostly dried and ground and "ordinary meals" gained at a rate of 0.77 lb. per head per day, while a comparable lot receiving only the "ordinary meals" gained 0.71 lb. About 1.5 lbs. of the dried rhizome was consumed per pound of gain. No records were kept of consumption of the other feeds.

A feeding trial during October and November with 29 White Leghorn pullets, four of which did not lay, is reported by A. Kinross. A lot of 10 birds, all layers, that received bracken rhizome in the form of meal as part of the wet mash averaged 10.3 eggs per bird during the period. Two other lots not fed bracken produced 23.8 and 34.1 eggs per layer, respectively. The wet mash fed the latter group contained corn meal.

**[Emergency concentrates for range sheep]**, C. E. Fleming (*Nevada Sta. Rpt. 1918, pp. 47–49*).—From a study of the situation resulting from the gradual extermination of the white sage (*Eurobia lanata*), the most important winter forage plant on the Nevada desert ranges, and the loss of sheep during periods of deep snow and very cold weather, the following emergency measures are advised: (1) Transportation of cottonseed cake to the range during November, (2) feeding of cake morning and evening during extreme weather, allowing the sheep to rustle in the middle of the day, and (3) division of the band for feeding purposes into units of about 500 head so that weak animals will have a better chance to secure feed. It is estimated that with wool at 40 to 50 cts. a pound a sheepman can afford to pay $45 a ton for cake delivered at a railroad station within hauling distance of his range.

**Effect of age or weight of pigs on rate and economy of gains**, W. L. Robison (*Mo. Bul. Ohio Sta., 4 (1919), No. 5, pp. 148–151*).—The growth and feeding records from birth of 3 groups of pigs selected for uniformity are here reported, the object being to compare the economy of each 100 lbs. increase in live weight until 500 lbs. was reached. The pigs were selected shortly after weaning and were fed individually, only barrows being used. Feed records before weaning are based on litter averages. One group was composed of pigs farrowed in the spring; the other two of fall pigs. The spring pigs were fed corn, middlings, and tankage (10:4:1) until slaughtered. When started on individual feeding the fall pigs (both lots) were given corn and tankage, 8:1; the proportion of corn was gradually increased during the next 24 weeks to 14:1, and remained constant thereafter. As each 100 lb. increment in live weight was attained a certain number of pigs in each group were slaughtered to secure information as to the weights and quality of the carcasses. The following tabulation is a summary of the combined results of the two groups of fall pigs:

*Influence of weight of pigs on rate and economy of gains.*

| Growth period. | Number of pigs. | Time from birth to end of period. | Initial weight per head. | Daily gain per head during period. | Average daily ration. | | Feed per pound of gain. | | Dressed weight at end of period. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Per head. | Per 100 pounds weight. | Corn. | Tankage. | |
| | | *Days.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Per cent.* |
| Birth to 50 pounds | 27 | ..... | 2.6 | 0.54 | 1.57 | 5.92 | ..... | ..... | ..... |
| 50 to 100 pounds | 27 | 144 | 50.4 | .89 | 3.01 | 4.01 | 3.05 | 0.33 | 77.7 |
| 100 to 200 pounds | 22 | 200 | 99.9 | 1.72 | 5.91 | 3.92 | 3.15 | .29 | 83.4 |
| 200 to 300 lbs. | 17 | 254 | 201.9 | 1.78 | 7.15 | 2.85 | 3.73 | .29 | 87.6 |
| 300 to 400 pounds | 12 | 312 | 301.0 | 1.70 | 7.74 | 2.21 | 4.25 | .30 | 88.2 |
| 400 to 500 pounds | 5 | 363 | 402.5 | 1.59 | 7.86 | 1.74 | 4.60 | .33 | 88.2 |

The spring pigs showed the same general results. The time from birth required to reach the successive 100 lb. weights were 125, 182, 231, 286, and 362 days, respectively. The amounts of feed required per pound of gain averaged, respectively, 2.9, 3.9, 4.5, 5, and 5.3 lbs. in the successive growth periods.

Some financial computations are given which suggest that "smaller returns over the total feed cost may be expected from pigs carried beyond the point at which the maximum rate of gain is reached than from those marketed before the rate of gain begins to decrease."

**Effect of age of pigs on the rate and economy of gains,** W. L. ROBISON (*Ohio Sta. Bul. 335 (1919), pp. 545–575, figs. 11*).—A final detailed report is made of the three experiments noted above. The pigs used were Duroc-Jerseys. The tabulations include the individual weights and feed records of each of the 37 animals from birth to slaughtering. Proximate analyses are presented of the feeds given the spring pigs and the first group of fall pigs, including linseed meal and skim milk fed to some of the pigs in the interval between weaning and individual feeding.

Considerable attention is given to the economic conditions which determine the most profitable time to stop a feeding operation in view of the data secured in the experiments. "The weight at which it is most profitable to market pigs full fed from birth is influenced by the method of proportioning the supplemental feed, by the amounts of supplement used and its relative price with that of corn or other carbonaceous feed, and by the relative price of feed and the market value of hogs." The most profitable market weight was heavier in the case of the groups in which the proportions of supplement was gradually reduced than in the case of the spring pigs where this proportion remained constant.

Three other experiments are briefly reported. (1) Two lots of 35-lb. pigs on rape pasture were compared, one receiving a full grain feed throughout the three 7-week periods of the test, the other a limited (2 to 3 per cent) grain ration for 2 periods and a full feed for the last period. At the end of 14 weeks the limited feed lot were not as heavy nor in as high condition as the full-fed pigs, but during the last third of the experiment they made more rapid gains. Their concentrate requirement per unit of gain was 13 per cent lower than the full-fed lot. (2) A duplication of this experiment with 40-lb. pigs during three 5-week periods yielded similar results. (3) A comparison was made of narrow, medium, and wide rations of corn and tankage during 18 weeks of dry-lot feeding divided into 6-week periods. "The medium ration contained approximately one-half as much tankage as the narrow one, and the wide ration one-half as much as the medium one. In all three rations the proportion of tankage to corn was decreased each week. For the first and second periods the pigs fed the most tankage made the most rapid gains and required the least feed per unit of increase in live weight. For the third period, however, they gained more slowly and required more feed per unit of gain than those of either of the other two lots."

**[Swine feeding studies],** (*Iowa Sta. Rpt. 1918, pp. 19–22, 29*).—Short preliminary reports are presented of several swine-feeding experiments.

Variously prepared meat meals and tankages (all made up on the 60 per cent protein basis) were tested as supplements to corn in the dry-lot fattening of hogs under the free choice system. A bone and blood meal mixture produced a pound of gain at an outlay of 3.8 lbs. of corn and 0.28 lb. of supplement. With blood meal as sole supplement, 4.2 lbs. of corn and 0.5 lb. of supplement were required for a pound of gain.

A lot of 52-lb. fall pigs fed shelled corn and a mixture of corn gluten feed and tankage (1:1) free choice required 150 days to attain a weight of 250 lbs., and consumed 3.5 lbs. of corn and 0.8 lb. of the mixed supplement per pound of gain. A similar lot fed corn and unmixed tankage reached the same weight in 136 days and used 3.6 lbs. of corn and 0.36 lb. of tankage for a pound of gain. When corn, tankage, and gluten feed were self-fed in separate feeders, it took 157 days, and the consumption per pound of gain was 3.46 lbs. of corn, 0.41 lb. gluten feed, and 0.3 lb. tankage.

In a study of buttermilk powder *v.* tankage, self-fed with corn, the requirements per pound of gain were in the former case 2.5 lbs. of corn and 0.9 lb. of buttermilk powder, and in the latter 3.1 lbs. of corn and 0.8 lb. tankage. The buttermilk fed lot made 30 per cent better gains. When corn was given in one feeder and a mixture of tankage and buttermilk powder (9:1) in another, the gains were increased 10 per cent over the straight corn and tankage fed lot.

In the course of investigations on forage crops it was found that young alfalfa and blue grass plants have a protein content as high as 40 per cent of the dry weight, but that as the season advances the percentage is reduced below 10. On the other hand, Dwarf Essex rape maintains a fairly constant protein percentage throughout the growing period.

"It has been determined that the lactic and acetic acids found in silage are easily digested and utilized when fed to swine. This means that the acids of rape silage would do no harm to growing pigs. It has also been found that the sulphuric and phosphoric acids which are formed when a grain or other high protein ration is digested are easily neutralized and are harmless to growing pigs. It is not necessary, therefore, to neutralize the acidity of a ration if it is otherwise satisfactory." It was found that an ounce per day of concentrated sulphuric acid properly diluted could be incorporated in a pig's ration without injurious effects. The ingestion of a "fairly large amount of alkali" was also harmless.

"We have some interesting preliminary developments indicating that the more rugged type of swine, as exemplified in the Tamworth or Yorkshire conformation, are of greater practical utility than the smaller, heavier types. Nevertheless, our tests indicate quite strongly to date that the deeply covered, large type of lard hog is highly efficient. The outstanding lesson to date is that the small, short, low-down, refined, heavily jowled, bulging 'hammed' pigs that develop early and stay fat continuously will have a high production cost after the 200-lb. mark is reached, and, furthermore, may experience considerable difficulty in reaching the heavier weights, because this type is more prone to pulmonary difficulties."

**Alfalfa meal for fattening pigs**, J. M. Evvard (*Breeder's Gaz., 75 (1919), No. 16, p. 918*).—At the Iowa Experiment Station two groups of weanling pigs averaging 52 lbs. in weight at the start were fattened on grain and tankage fed separately in self-feeders. The first lot, whose grain ration was shelled corn only, reached an average weight of 225 lbs. per head in 115 days. The second lot, which received a mixture of ground corn and ground alfalfa, did not attain this weight until 138 days, a 20 per cent longer period. The second lot consumed less tankage than the first, but the data on feed cost of gain indicate that about 1.8 lbs. of alfalfa and 3.2 lbs. of corn were required to replace a pound of tankage. Without counting the additional 23 days labor, the alfalfa-fed lot was thus not profitable.

**Swine management in Idaho**, O. E. McConnell (*Idaho Sta. Bul. 116 (1919), pp. 3–35, figs. 14*).—A brief treatise on swine management under Idaho conditions, including swine types, housing, feeding, and management, and prevention of disease.

The nutrition of the horse, J. B. LINDSEY (*Massachusetts Sta. Bul. 188 (1918), pp. 243–263*).—Some of the classic work on the nutrition of horses is reviewed, and report made of several feeding experiments with two horses during three years under practical working conditions.

A daily ration of 8.5 lbs. of alfalfa hay and 8.5 lbs. of oats and corn (1:4) per 1,000 lbs. live weight, found satisfactory for artillery horses by the Kansas Station (E. S. R., 29, p. 873), did not prove sufficient for the two horses doing "reasonably hard" farm work, as they lost in weight and were restless. Increasing the ration by 10 per cent checked the loss in weight but not the restlessness. Partial replacement of the alfalfa by timothy hay served to reduce the restless action considerably.

"While recognizing the large number of horses in the Kansas experiment and the satisfactory results secured, on the basis of our own observations and the accepted feeding standards, it seems to the writer that the amounts of the several feeds are not likely to be sufficient, nor the combination particularly satisfactory, for most work horses. It is believed that for each 100 pounds of live weight a pound of roughage is a reasonable allowance, and that one-half of this roughage may consist to good advantage of alfalfa, and the balance of a timothy mixture."

Various successful modifications of a grain ration of oats, corn, and bran by the partial or complete substitution of brewers' dried grains, velvet bean-and-hull meal, or linseed meal for one of the ingredients are reported on the basis of extended tests. Mixed timothy hay was used in these experiments. It was found that 50 per cent or more of the oats could be replaced by an equal weight of brewers' grains. Mixtures of oats, corn, velvet-bean feed, and bran (5:8:2:2 and 5:7:3:2) were given continuously for over 3 months and "the results were in every way satisfactory." Linseed meal was fed as a grain supplement for 10 weeks and proved practicable. The mixture mostly used was oats, whole corn, and linseed meal (5:8:1). A higher proportion of linseed meal was not so well relished, as the meal did not mix well with the unground corn.

**Egg-weight as a criterion of numerical production in the domestic fowl**, P. [B.] HADLEY (*Science, n. ser., 49 (1919), No. 1270, pp. 427–429*).—A year's egg records of 31 hens (breed not specified) at the Rhode Island Experiment Station are summarized to show that the relative difference between the average weight of the 10 or fewer eggs laid by a hen at the period of highest production of the flock in September and the average weight of the first 10 eggs she lays at the beginning of the laying year is a good index of her yearly production. Similar but less striking results are claimed when egg weights during the April peak in production are used in the same comparison. It is held that higher producing hens can be identified more readily by the greater increase in the weight of their eggs than by any other means. A tentative announcement of a "fundamental law" of egg production is made embodying these facts.

## DAIRY FARMING—DAIRYING.

**Dairy production in Ohio**, R. I. GRADY and M. O. BUGBY (*Ohio Sta. Bul. 334 (1919), pp. 509–541, figs. 3*).—This bulletin is a report on the cost of producing milk as revealed by 84 yearly records of 33 Ohio dairy herds during the period 1910–1915. Two preliminary reports have been noted (E. S. R., 37, p. 575; 40, p. 375). The methods of collecting the data are explained in detail, and the blank forms supplied to collaborators are reproduced. A noteworthy feature of the report is the fact that the individual herd averages of all the items

entering into the computations (except inventory values of cows) are tabulated as well as the area of the farm, the size of the herd, the predominating breed, and the highest and lowest milk and butter fat production in each herd.

The average amounts of feed and labor in all herds consumed annually per cow were as follows: Grain 1,534 lbs., silage 4,971 lbs., hay 1,462 lbs., stover 1,065 lbs., green feed 484 lbs., pasture 187.2 days, man labor 162.8 hours, and horse labor 26.8 hours. About 62 per cent of the grain was purchased. Feed constituted 54 per cent, labor 28 per cent, and other charges 18 per cent of the total cost. The average expenditures for items other than feed and labor are also computed as percentages of the average inventory value of a cow ($69.70), viz: Land and building charge 8.1, equipment 3, interest, insurance, and taxes 6.3, service fees 2.5, depreciation 3.5, and miscellaneous 4.3, making a total of 27.7 per cent. As evidence that this method of dealing with such items leads to uniform results, the data furnished by Bulletin 501 of the U. S. Department of Agriculture (E. S. R., 36, p. 873) are treated in a similar manner and the items total 27.9 per cent of the inventory value of a cow.

The fertilizing constituents recovered in the manure of a cow are computed for each herd. The average estimates are nitrogen 103.9, phosphoric acid 42.9, and potash 78.4 lbs. The average annual milk production was 5,884 lbs., and the average butter fat 255.4 lbs. The total returns from milk, calves, and manure averaged $124.62 per cow, while the expenses average $98.55, leaving $25.47 net returns. In five of the farms the expenses exceeded the gross returns. The net cost of producing milk, including loss on young stock, was $76.66 per cow, or $1.30 per 100 pounds of milk. In July, 1918, it is estimated, the net costs would have been $1.78 and $2.61, respectively. No charge for managerial ability was added to these costs.

"In fixing a price for milk, it would be unjust to use the average cost of production, as this would cause about one-half of the dairymen to operate at a loss, and no line of business could long endure such conditions. If 20 per cent of the dairymen who furnished the foregoing data had been eliminated because of inefficiency, a price could not justly have been set at a lower figure than $1.58 or, under July, 1918, prices, approximately $3.58. If seasonal variations were computed according to Warren's suggestion, such a price would range from about $2.50 to $4.30 per 100 lbs."

**The composition, digestibility, and feeding value of alfalfa,** J. B. Lindsey and C. L. Beals (*Massachusetts Sta. Bul. 186 (1918), pp. 105–141*).—This paper considers alfalfa as a feeding stuff with special reference to its value in milk production, and is intended partly as a complement to a study of alfalfa culture in Massachusetts previously noted (E. S. R., 31, p. 735). Seven feeding experiments with dairy cows are reported, each conducted by the reversal method during two periods. From 4 to 8 cows were used in each. In experiment 6 the periods were 4 weeks long; in the others, 5 weeks.

Experiments 1 to 3 compare alfalfa hay, beet pulp, and corn meal with first-cut mixed hay, beet pulp, and corn gluten feed or meal. The hay in each ration furnished about 71 per cent of the dry matter. The 5 weeks' milk yield of the 22 animals on the alfalfa ration totaled 15,866 lbs. and on the mixed hay ration 15,733 lbs. Since there was a small difference in favor of the alfalfa ration in each experiment, this result is held to indicate a slight stimulating effect of alfalfa on milk flow. The animals showed a total increase in weight of 13 lbs. on the alfalfa and 481 lbs. on the mixed hay ration, a difference attributed to the lower energy value of alfalfa. The total protein in the milk (N×6.25) produced by the alfalfa ration was 545.3 lbs. and by the mixed hay ration 558.8 lbs. The total milk solids were, respectively, 2,125 and 2,149 lbs. These

results show that the protein of the alfalfa rations, 78.2 per cent of which was from alfalfa hay, was as satisfactory a source of protein for milk formation as the mixed hay rations where 58.1 per cent of the protein came from the beet pulp and corn gluten. No marked influence of the diuretic effect of alfalfa was discovered on either milk yield or the milk ingredients.

Experiments 4 and 5 compare alfalfa hay and rowen (hay from second cutting of mixed grasses). The grain in both rations was the same, corn meal and wheat bran (7:3). In experiment 4, alfalfa apparently increased the milk yield 5.2 per cent, but in the fifth experiment there was only a 0.5 lb. difference in the totals of the two rations.

The milk produced per 100 lbs. of dry matter consumed was in the case of the alfalfa ration 97.76 lbs., and in the case of the rowen 93.77 lbs., while the amounts of fat produced per unit of dry matter were identical. In digestion trials conducted in connection with these experiments, the digestibility of the rowen protein was only 60 per cent whereas the average of previous trials is 70. The alfalfa protein was 72 per cent digestible.

In experiment 6 a mixture in equal parts of alfalfa and English hay was compared with unmixed English hay. Gluten feed was used as a protein supplement to the latter. Corn-and-cob meal and bran formed part of each ration. The milk yields totaled, respectively, 5,540 and 5,602 lbs., with only trifling differences in the milk solids.

Experiment 7 was a repetition of the sixth except that corn stover was substituted for English hay in the alfalfa ration. The latter ration produced 8.2 per cent less milk and 8.6 per cent less milk solids than the English hay ration. "The writer is convinced that the milk shrinkage on the alfalfa ration was due largely to the corn stover. While of good quality it was stooked out-of-doors and brought to the barn every few days and cut fine before being fed. It varied considerably in moisture content, depending upon the weather. If the stover had been brought from the field in November and stored under cover, in all probability more satisfactory results would have been secured."

Proximate analyses are given of the samples used of mixed hay, alfalfa hay, English hay, rowen, corn stover, corn-and-cob meal, corn meal, corn gluten meal, corn gluten feed, wheat bran, beet pulp, and molasses beet pulp. Available analytical data for green alfalfa and red clover at various stages of growth are also summarized. The results of new digestion trials with alfalfa hay (2 series), red clover, and rowen are reported.

The tabulations include the milk, the milk solids, and the fat produced by individual cows in each experiment. For experiments 1 to 5, the nitrogen in the milk is also tabulated individually.

In summing up their work, the authors state that "in the light of our present knowledge it is preferable, particularly in the Eastern States, not to use alfalfa as the entire source of roughage for milk production, but to feed one-half alfalfa and one-half hay, or two-thirds alfalfa and one-third corn stover, or 10 to 15 lbs. of alfalfa and 1 bu. of silage daily. Such combinations, together with a grain ration of 10 to 80 per cent corn-and-cob meal and 20 to 30 per cent wheat bran or oats or barley, ought to give quite satisfactory results."

**The value of corn bran for milk production,** J. B. LINDSEY and C. L. BEALS (*Massachusetts Sta. Bul. 186 (1918), pp. 142–153*).—To compare corn bran and wheat bran for milk production two experiments are reported with 6 and 8 cows, respectively, each ration being tested by the reversal method during two 5-week periods in each experiment. The basal ration consisted of mixed hay, corn gluten feed, ground oats, and cottonseed meal. Four pounds of the appro-

priate bran was daily given to each animal. During wheat bran feeding 1.2 per cent more milk and 1.3 per cent more butter fat on the average were produced.

Proximate analyses of the feeding stuffs used are reported. The corn bran was noticeably lower than the wheat bran in ash, protein, and fat. It is stated that digestion trials made at the station with sheep show that the coefficient of digestibility of dry matter of corn bran is 80 and of wheat bran 66.

**Milking machines: III, As a source of bacteria in milk. IV, Methods of maintaining in a bacteria-free condition,** G. L. A. Ruehle, R. S. Breed, and G. A. Smith (*New York State Sta. Bul. 450 (1918), pp. 113–181, figs. 11*).—These studies, of which a preliminary report has been noted (E. S. R., 38, p. 377), are grouped in a series with two previous bulletins (E. S. R., 28, p. 472) and include observations of the use of milking machines on the station herd and at 10 commercial dairy farms.

To study the milking apparatus as a source of bacteria, an artificial udder was constructed from which sterile water was "milked" by the machine. To determine at what stage bacteria gets into the water, means were devised for collecting samples at two points in its passage into the pail. The chief source of bacteria was found to be the teat-cups and rubber tubes, although the pail in some cases was an important medium of infection. The suction trap placed upon the recent types of one of the makes of milking machines used was found to be efficient in preventing the return of contaminated condensation water from the vacuum piping to the pails.

The stable air which enters the machine during milking was analyzed and found not to be responsible for increasing the bacterial content more than 34 per cubic centimeter under the worst conditions tested. The cotton filters for which provision is made on one machine were found to remove more than two-thirds of the bacteria from the air and also a small amount of dust. Since the total amount of contamination from the air was insignificant, the improvement due to the filters was too slight to be detected in ordinary analyses of machine-drawn milk.

Dropping the teat-cups to the floor in dirty bedding was found to cause relatively large amounts of dirt to appear in the pails of the machines; but the bacteriological analyses of the sterile water, milked through the machine at the same time, did not reveal excessively high counts. These conditions failed to give counts in excess of 25,000 per cubic centimeter. Here, as in other studies of the amount of bacterial contamination derived from dust, the germ count was found to be an unsatisfactory index of the amount of dirt and filth present.

Although it was found possible to sterilize milking machines completely by means of steam applied to the metal parts and by harmless antiseptics on the rubber parts, the precautions necessary are considered impracticable where certified milk is produced and quite impossible on the average farm. Satisfactory bacterial results were secured where practicable methods were used for keeping the machines cleaned, provided the teat cups and tubes were immersed in any of the following antiseptic solutions: (1) Brines containing at least 10 per cent of salt; (2) solutions of chlorid of lime; (3) a combination of brine and chlorid of lime; (4) lime water; (5) cold running water; and (6) a commercial germicide, which, however, is not recommended for general use, because a trace of it gives milk a disagreeable taste. Chlorid of lime and running water were ineffective if the temperature of the solution was as great as 60° F. The solution recommended for general use is chlorid of lime dissolved in a saturated brine. Antiseptic solutions were not found to be successful unless the teat cups and tubes were maintained in a cleanly condition.

Control of bacteria in milking machines, F. H. Hall (*New York State Sta. Bul. 450, popular ed. (1918), pp. 3–15, fig. 1*).—This is a popular edition of the above.

Clarification of milk, I, C. E. Marshall, E. G. Hood et al. (*Massachusetts Sta. Bul. 187 (1918), pp. 151–242, figs. 10*).—The amount and nature of clarifier slime and the immediate effect of clarification upon milk are the topics considered.

A section on the clarification of certified milk by the late E. L. Davies, an officer in the Canadian Army, is included. It records the percentage of slime secured in 440 tests of the milk of 74 cows, together with the breed and age of the cow and the stage of lactation. The average slime percentage was 0.067. In 16.8 per cent of the tests the slime percentage was 0.1 or over. In 14.7 per cent of the cases the slime was bloody.

The authors add to these data a number of other determinations, showing particularly that increased temperature and increased time of holding (resulting in greater acidity) tend to increase the amount of slime (dry weight) from a unit amount of milk, and comment as follows: "The amount of slime differs widely when secured from the milk of the same cow, from milk of different individual cows, and from mixed milks, whether the mixed milks have the same origin or not. It is also manifest from the work of this laboratory that samples from the same milk when clarified under the same conditions yield practically the same amount of slime. It follows, therefore, that the causes for these variations must be found in the condition of the animal, the conditions which surround the manipulation of the milk, and the conditions which are involved in the clarification. From Lieut. Davies's investigations it seems clear that with the beginning of the period of lactation there is a great increase of slime. This may be attributable to the colostral milk, in which colostral cells are numerous. Evidence also seems to point directly to inflammatory conditions of the udder as a cause of increase; garget and other products of inflammation and germ action within the udder are common, probably much more so than is usually recognized."

The slime was found to be composed of insoluble dirt, bacteria, leucocytes ("so-called"), fibrin ("so-called"), and any garget discharge present in the milk. A number of quantitative determinations of the bacteria and leucocytes are recorded. The clarifier was found more efficacious in the removal of insoluble dirt than the cotton filters used in the Wisconsin sediment test. Some observations are included as to the solubility of manure and stable dirt in water and milk. It is held that the reduction, if any, in the nutritive value of milk as the result of clarification may be disregarded.

The leucocyte counts before and after clarification are tabulated for 25 samples of certified milk and 6 samples of commercial milk, and bacterial counts for 37 certified and 15 commercial milk samples, while several similar series of counts are assembled from the literature. In about 70 per cent of the tests of fresh certified milk clarification effected a reduction in bacterial content as shown by plating methods. Milk held before clarification seemed to increase its bacterial count by clarification to an extent more or less proportional to the length of holding. These results are thought to indicate that fresh certified milk is relatively free from clumps of bacteria, whereas clumping takes place in held milk. The disruption of clumps through clarification is considered the cause of the increased counts. Only 10 or 15 per cent of the market milk samples showed decrease in bacterial counts after clarification, an indication of extensive clumping.

Ten graphs are given comparing cultures of clarified milk, unclarified milk, and clarified milk plus slime with respect to the number of colonies visible

at two-hour intervals for 72 hours after plating. Tables are also given showing the effects of clarification upon pure cultures of several species of bacteria.

**Study of Babcock test for butter fat in milk** (*Iowa Sta. Rpt. 1918, p. 30*).—"The Babcock test for milk, when read from the top on the upper meniscus to the bottom of the lower meniscus, gave results which are higher than those obtained by the gravimetric (Roese-Gottlieb) method. On the average of 190 comparisons, as carried out in the work reported, the difference amounted to 0.06 per cent. . . . The Babcock test would read about 0.11 per cent low, depending somewhat on the per cent of fat in the sample, if the meniscuses were not included in the reading."

"The amount of fat left in the liquid below the fat column is quite variable and on the average equaled 0.13 per cent expressed as reading on the neck of the test bottles. There were impurities in the fat column that on the average amount to 0.78 per cent of the reading."

**A bacteriological study of the method of pasteurizing and homogenizing the ice cream mix,** B. W. Hammer and L. R. Sanders (*Iowa Sta. Bul. 186 (1919), pp. 17–26*).—As part of a series of bacteriological studies of ice cream (E. S. R., 38, p. 868), the authors have made bacterial counts of nine pasteurized and homogenized mixes and of the ice cream made therefrom.

The heating of the mix to about 145° F. but without holding resulted in a decrease in bacteria of from 91.5 to 99.5 per cent, the average being 96.4. Part of each pasteurized mix was run through the homogenizer without pressure to see whether the machine might be an important source of contamination. In all cases the count was higher after such a run and was generally more than doubled. "The homogenizer was given what was considered to be satisfactory care, since it was thoroughly washed after use, and then in most runs flushed with boiling water just before use." In 6 cases the rest of the mix, which was run through under the usual pressure, had a lower content than the nonpressure portion, sometimes approximating that of the mix immediately after pasteurization. The operation of the machine under pressure is thought to have a tendency to break up clumps of bacteria. In 4 runs the homogenized mix was passed over a cooler and the bacterial count was thereby increased slightly.

## VETERINARY MEDICINE.

**Regional anatomy of domestic animals,** L. Montané and E. Bourdelle (*Anatomie Régionale des Animaux Domestiques. Paris: J. B. Baillière & Sons, 1913, vol. 1, pts. 1, pp. VII+512; [2], pp. 513–1069, figs. 564; 1917, vol. 2, pp. [VI]+384, figs. 259*).—Volume 1 of this work deals with the horse and volume 2 with ruminants.

**Farm hygiene,** P. Regnard and P. Portier (*Hygiène de la Ferme. Paris: J. B. Baillière & Son, 1917, 2. ed., pp. 441, figs. 167*).—This volume, which is one of the Encyclopédie Agricole published under the direction of G. Wery, deals particularly with infectious diseases and parasites attacking farm animals, their control, and remedial measures.

**The municipal abattoir at Alexandria, Egypt,** F. Piot Bey (*Notice sur l'Abattoir Municipal d'Alexandrie (Egypte). Alexandria: Whitehead, Morris & Co. (Egypt), Ltd., 1917, pp. 47, pls. 22, fig. 1*).—A detailed account of this municipal slaughterhouse.

**Seventh annual report of the commissioner of animal industry for the year ending November 30, 1918,** L. H. Howard (*Ann. Rpt. Comr. Anim. Indus. [Mass.], 7 (1918), pp. 46, figs. 3*).—Included in this report on the occurence of and work with infectious diseases are charts showing the reported num-

ber of cases of bovine tuberculosis, glanders, and rabies in Massachusetts for the 10-year period ended 1918.

Report of proceedings under the diseases of animal acts, with returns of the exports and imports of animals for the year 1917, D. S. PRENTICE (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Diseases Anim., 1917, pp. 30*).—The usual annual report (E. S. R., 38, p. 180).

Veterinary service and meat inspection in Norway in 1917 (*Norges Off. Statis., 6. ser., 1917, No. 148, pp. VII+213*).—The usual annual report (E. S. R., 39, p. 787).

Veterinary research, annual report of director, 1916–17, A. THEILER (*Union So. Africa Dept. Agr. Rpt. 1916–17, pp. 45–50*).—A brief statement of investigations carried on during the year.

Report of the government bacteriologist, C. J. POUND (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1915–16, pp. 88–91, pl. 1*).—Included in this report of work of the year are accounts of further observations with reference to alleged tick-resisting cattle, the fertility of ticks matured on so-called resistant cattle, and further observations on the life history of the warble fly (*Hypoderma bovis*).

Studies in forage poisoning.—The relation of B. botulinus to forage poisoning or cerebrospinal meningitis in horses, R. GRAHAM and A. L. BRUECKNER (*Jour. Bact., 4 (1919), No. 1, pp. 1–21, figs. 4*).—This is a report of investigations, a reference to which has been previously noted (E. S. R., 39, p. 387).

"A goat injected with sublethal doses of broth culture of the bacillus (ss) isolated from the silage developed an antitoxic serum which, injected intraperitoneally, apparently protected guinea pigs against a fatal amount of the homologous toxin per os. The protective nature of the goat serum was also observed in guinea pigs receiving fatal amount of *B. botulinus* per os.

"*B. botulinus* antitoxic serum prepared from a mule and injected intraperitoneally into guinea pigs apparently provided a protection against 10 times the lethal amount of the culture filtrate of the bacillus (ss) isolated from the silage and against 5 times the lethal dose of the unfiltered broth culture.

"Two horses ingested in wholesome feed 2 cc. broth culture of the bacillus (ss) isolated from the silage and were apparently protected by an intravenous injection of *botulinus* antitoxic serum. A control horse receiving a similar amount of the unfiltered broth culture manifested clinical symptoms of forage poisoning and died. Post-mortem examination revealed gross anatomic lesions analogous to some of the gross lesions observed in animals naturally afflicted with forage poisoning.

"Serum immune to *B. botulinus* possessed a positive agglutinating potency toward the homologous strain, as well as toward the bacillus (ss) isolated from the silage. The agglutinins present in serum immune to the bacillus (ss) isolated from the silage were active against *B. botulinus* as well as against the homologous strain.

"The cultural, morphological, pathological, and serological relation observed between *B. botulinus* and the bacillus isolated from the silage in preliminary experiments are suggestive of the possible etiologic significance of *B. botulinus* or closely allied anaerobes in some outbreaks of forage poisoning or cerebrospinal meningitis in horses."

Report of the department of chemistry, C. A. JACOBSON (*Nevada Sta. Rpt. 1918, pp. 39–44, figs. 3*).—This report relates to investigations made with a view to isolating and characterizing the toxic constituent of a species of death camas which occurs in Nevada and is quite different from *Zygadenus intermedius* studied at the Wyoming Station (E. S. R., 30, p. 412), being most nearly

like *Z. paniculatus*. This form grows at an elevation of from 5,500 to 7,000 ft. and covers a wide area over the Sierra foothills to considerable distances up the mountains.

Considerable losses to sheepmen due to this death camas have been recorded, but nearly always when the pasturage was scanty or following a long and exhausting drive of the herd, there being scarcely any danger from it when the sheep are kept grazing under normal conditions.

The name Z-alkaloid is given to the poison liberated, for the sake of convenience in referring to it. It was found to be soluble in ethyl and methyl alcohol, chloroform, and acetone, but much less in benzene and carbon tetrachlorid. With one exception all attempts to obtain a crystalline product from all these solvents by varying the conditions, such as time, temperature, and pressure, failed. The yield of the purified Z-alkaloid was found to be only about 0.3 per cent of the weight of the dried death camas plant. The crude alkaloid was tested and found poisonous to rabbits. The toxicity of the plant has been determined at different periods of growth and found to be poisonous at all periods except when the plant has dried up in late summer. While the physiological action of the poison has not been carefully studied, it produced at first twitchings of the head and limbs, then a comatose condition with rapid and shallow respiration, after which the animal died in a convulsion. The Z-alkaloid has no relation to zygadenin isolated at the Wyoming Station.

**Curative treatment of bush sickness by iron salts**, C. J. Reakes and B. C. Aston (*Jour. Agr. [New Zeal.], 18 (1919), No. 4, pp. 193–197, figs. 2*).—"Summarizing the results of the medicinal experiments to date, it would appear that of the inorganic preparations, while either the administration of (a) phosphates or (b) iron compounds to cattle on phosphate-dressed pasture may enable them to be kept healthy for a much longer period than otherwise would be possible, it is only by drenching with a sirup-of-iron phosphate that animals may be kept healthy indefinitely or cured of bush sickness. Of organic compounds, it is certain that the double citrate of iron and ammonium is a quicker cure for bush sickness than the sirup-of-iron phosphate. It is probable that other organic salts of iron would be similarly successful."

**Castor bean meal as a poultry food**, H. T. Atkinson (*Utility Poultry Jour. [Harper Adams Agr. Col.], 4 (1918–19), No. 2, p. 21*).—Feed consisting of 1 part castor bean meal and 5 parts mixed meal comprised of sharps, ground oats, etc., was fed to cockerels in quantities of 4.5 to 5 oz. per bird each day, a little grain food being given in addition and grit and water also being available. The feed was eaten eagerly, but the birds steadily lost weight, and by the end of 3 weeks the total loss in weight was 4 lbs. 10 oz. The loss in weight continued steadily and at the end of the thirty-sixth day one bird died, followed 4 days later by another. On the fortieth day the castor meal feed was discontinued and the 4 remaining birds fed on ordinary meal. After the change of food the birds commenced to recover slowly, but at the end of 3 weeks had put on but very little flesh.

**The principles of acidosis and clinical methods for its study**, A. W. Sellards (*Cambridge: Harvard Univ. Press, 1917, pp. VI+117, pl. 1*).—The several chapters of this work deal with the equilibrium between acids and bases, methods of diagnosing acidosis, behavior of the body in health, and in acidosis toward sodium bicarbonate, relative value of the various tests for acidosis, definition of acidosis, occurrence of acidosis, therapy, differential diagnosis, and etiology of acidosis. A résumé follows and technique of methods is dealt with in an appendix. A bibliography of 71 titles is included.

**Anaphylaxis, allergy; antianaphylaxis, antiallergic therapy**, R. KRAUS (*Rev. Inst. Bact. [Argentina], 2 (1919), No. 1, pp. 1–18*).—This is a summary of modern investigations and theories regarding experimental anaphylaxis and its chemical relationship to allergy.

**Anaphylatoxin and anaphylaxis.—XI, Ultra-filtration and fractionation of anaphylatoxin**, P. H. DEKRUIF and A. K. EGGERTH (*Jour. Infect. Diseases, 24 (1919), No. 6, pp. 505–532*).—In continuation of the study of anaphylatoxin and anaphylaxis previously noted (E. S. R., 37, p. 578), an attempt has been made to locate the toxic principle of anaphylatoxin by applying various methods of fractionation of serum proteins and by ultrafiltration.

It was found that the toxic principle of rat and guinea pig anaphylatoxin could be recovered on the globulin fractions of the serum. Various methods of isolating these fractions were studied. The best results were obtained by removal and purification of the serum proteins by precipitation of the serum in the cold with absolute alcohol or acetone and extraction of the precipitate with ether. In this process the toxic principle was recovered quantitatively on the serum proteins, and by fractionation was concentrated on the euglobulin fraction.

By means of ultra-filtration, using a membrane prepared from a solution of celloidin in alcohol-ether with castor oil and glycerin as modifying agents, 79 per cent of the total serum protein could be filtered off with a total retention of the toxic principle in the sac. The results obtained are considered "important in that they furnish an excellent and simple means of concentrating the toxic principle, furnish material for a tentative hypothesis of the nature of the toxin, and effectively exclude the notion that protein degradation products are concerned in this toxicity."

A preliminary report of the fractionation of primarily toxic normal and immune sera is also given. Such toxins are not recovered on the euglobulin fraction as in the case of anaphylatoxin but on the water-soluble globulin.

**On the separation of antitoxin and its associated proteins from heat-denatured sera**, A. HOMER (*Biochem. Jour., 13 (1919), No. 1, pp. 45–55*).—The investigations on antitoxic sera previously noted (E. S. R., 40, p. 288) have been extended to determine (1) "to what extent the limits for the precipitation with ammonium sulphate can be narrowed so as to include, in the second fraction precipitates from heated sera, only those proteins with which the antitoxin is definitely associated, and (2) whether or no the antitoxin is evenly distributed throughout the protein fractions precipitated at successive stages between the limits indicated in (1)."

The results indicate that, for the complete recovery of antitoxin during the concentration of sera showing a heat-denaturation of 35 per cent or less by fractional methods employing the use of ammonium sulphate, it is advisable to precipitate the second fraction between 30 and 45 per cent of saturation with the sulphate, as reduction of the upper limit results in incomplete precipitation of pseudoglobulin and antitoxin and raising of the lower limit results in the precipitation of antitoxin in a form not readily soluble in brine.

In heated sera showing a denaturation of 35 per cent or less, the bulk of the antitoxin is associated with the proteins precipitated between 36 and 45 per cent of saturation with ammonium sulphate. The further fractionation of the protein isolated between these limits "showed that the percentage of the total antitoxin precipitated between progressively increasing percentages of saturation with the sulphate is directly proportional to the percentage precipitation of protein at the respective stages. From these observations it is clear that, in order to isolate antitoxin, means other than the fractional precipitation of the serum proteins must be employed."

**On the increased precipitability of pseudoglobulin and its associated antitoxin from heat-denatured solutions**, A. Homer (*Biochem. Jour., 13 (1919), No. 1, pp. 56–64, figs. 3*).—The conclusion drawn in the above paper that in order to isolate antitoxin as a separate entity means other than the fractional precipitation of pseudoglobulin solutions by salts must be employed is further substantiated by the results of this study, which are summarized as follows:

"(1) The increased precipitability of pseudoglobulin from its heat-denatured solutions at concentrations of ammonium sulphate ranging from 26 to 47 per cent of saturation is a function of the heat-denaturation. (2) The increased precipitation of pseudoglobulin thus induced in (1) at 30 per cent of saturation with ammonium sulphate is accompanied by an increased precipitation of antitoxin. With the least extensive denaturation, the percentage of the total proteins precipitated at this stage is greater than that of the antitoxin; as the denaturation increases the further increased precipitability of the protein becomes a linear measure of the increased precipitation of the antitoxin. (3) In the concentration of antitoxin sera by the fractional precipitation of the serum with ammonium sulphate, there is no need for a preliminary prolonged heating of the serum. The results that are now obtained by the isolation from the heated serum of the protein fraction precipitated between 30 and 44 per cent of saturation with ammonium sulphate could be obtained from the unheated serum between 36 and 50 per cent of saturation with the sulphate."

**Vaccines and sera, their clinical value in military and civilian practice**, A. G. Shera (*London: Henry Frowde and Hodder & Stoughton, 1918, pp. XXI+226*).—This book deals with the clinical value of vaccines and sera in military and civilian practice, illustrated largely by cases from the author's own experience. In addition to the subject matter proper the book contains an introduction by C. Allbutt, a classification of vaccines and sera according to their therapeutic value from the prophylactic and curative standpoint, a glossary of terms, and a list of literature references.

**Sodium oxy-mercury-ortho-nitro phenolate (mercurophen) with special reference to its practical value as a disinfectant**, J. F. Schamberg, J. A. Kolmer, G. W. Raiziss, and M. E. Trist (*Jour. Infect. Diseases, 24 (1919), No. 6, pp. 547–582, figs. 5*).—This is a more extended report of the properties and disinfecting value of mercurophen previously noted (E. S. R., 38, p. 481). Throughout the study other mercurial preparations, particularly mercuric chlorid, were employed for comparative tests which are reported in detail.

Mercurophen or sodium oxy-mercury-ortho-nitro phenolate was found to possess certain superior properties over other mercurial compounds, as follows:

In germicidal activity, mercurophen is equal or superior to mercuric chlorid and other mercurial compounds containing more mercury. It is generally more rapid in its germicidal action and less toxic than other mercurial compounds. It appears to possess a special destructive affinity for cocci and spore-forming bacilli, is capable of temporarily raising the bactericidal action of the blood after intravenous administration, is somewhat more trypanocidal than mercuric chlorid, and maintains a higher degree of germicidal activity in blood serum.

Mercurophen does not precipitate protein in as high concentrations as 1:100, nor does it irritate the skin or tarnish surgical instruments. It has proved superior to mercuric chlorid in the disinfection of urine, feces, sputum, pus, catheters, instruments, rubber gloves, and the skin.

**The subcutaneous injection of Tallianine in cases of respiratory disease**, J. F. D. Tutt (*Vet. Jour., 75 (1919), No. 527, pp. 180–184*).—From the experiments conducted and here reported upon it is concluded that "Tallianine, if used early and repeated at intervals, has a marked effect in cases of respira-

tory disease, and is the best remedy so far discovered for subcutaneous medication. Its action is rapid, an alteration in respiration has been observed within 10 minutes of inoculation, and usually within 30 minutes in every case.

"It can be used when the administration of medicines per os is impracticable. It should 'bubble' on exposure to the air. In some supplies this was not observed, and in these cases there was little or no benefit from its use. It can be used for smaller animals, such as the dog, in doses of 3 to 5 cc. in cases of the respiratory form of distemper, and has given good results."

**Studies on anthrax vaccine.—III, Accidents following vaccination,** R. KRAUS and P. BELTRAMI (*Rev. Inst. Bact. [Argentina], 2 (1919), No. 1, pp. 98–113, figs. 5*).—This is a continuation of work previously noted (E. S. R., 40, p. 582).

Reports are given of accidents following vaccination which emphasize the necessity of an official control of the preparation of the vaccine. It is thought that certain intercurrent diseases and other factors such as pregnancy lower the natural resistance of the animal and decrease the artificial immunity conferred by the vaccine. The virulence of vaccine II does not increase in the organism provided it is not virulent for rabbits, but vaccines which are virulent for rabbits are liable to increase in virulence and are thus dangerous to use.

**The treatment of human anthrax with normal bovine serum, IV,** J. PENNA, J. BONORINO CUENCA, and R. KRAUS (*Rev. Inst. Bact. [Argentina], 2 (1919), No. 1, pp. 89–97*).—Further success is reported in the treatment of human anthrax with normal bovine serum (E. S. R., 40, p. 582). In 372 cases thus treated the mortality was only 6.2 per cent.

**Malignant epizootic aphtha (foot-and-mouth disease),** SACCO (*Vet. Jour., 75 (1919), No. 526, pp. 139–141*).—A grave form of foot-and-mouth disease has been spreading through Italy since the beginning of December, having already extended over upper and middle Italy. In certain byres in Lombardy 50 of 100 animals are said to have been lost within a few days.

**The trypanosomes found in domestic mammals in south-central Africa,** H. V. HORNBY (*Vet. Jour., 75 (1919), No. 526, pp. 128–138*).—"The common trypanosomes found in domestic mammals in south-central Africa are three in number, viz., *Trypanosoma brucei, T. congolense,* and *T. vivax.*

"They are readily distinguishable by their morphological characters. *T. brucei* is very fatal to equines, smaller ruminants, and dogs, but is almost nonpathogenic for cattle. *T. congolense* is the commonest cause of trypanosomiasis of cattle, but it is also pathogenic for the other domestic mammals. *T. vivax* resembles *T. congolense* in the forms of disease it causes in stock. Dogs are generally immune to its ill effects.

"The distribution of these parasites is coincident with that of tsetse flies. Different strains of the same species of trypanosome vary greatly in their range of virulence. Individuals and races of the same species of domestic animal vary greatly in the resistance they offer to infection. The presence in the blood of one species of parasite appears to inhibit the development of another.

"A fourth species, *T. simiæ,* causes disease in pigs. It is conceivable it may be only a variety of *T. congolense* modified by passages through the warthog."

**The tuberculin test at Jackson, Mich.,** T. H. BROUGHTON (*Purdue Agr., 13 (1919), No. 8, pp. 367–369, 398, 400*).—The tuberculin test was started in June, 1915, and all cattle supplying milk for the city of Jackson were tested. Four and two-tenths per cent reacted and were slaughtered. The second year only 2 per cent reacted to the test, and a considerable number of the reactors were from herds that were not tested the previous year, due to the fact that they were not producing milk for the city.

**Recent discoveries concerning the life history of Ascaris lumbricoides,** B. H. RANSOM and W. D. FOSTER (*Jour. Parasitology, 5 (1919), No. 3, pp. 93–99*).—The authors here review the results of recent investigations of *A. lumbricoides*, and report upon studies carried on in continuation of those previously noted (E. S. R., 38, p. 385).

The authors have found that in guinea pigs and rabbits the larvæ behave in respect to their development, migration, and elimination as they do in rats and mice, and in respect to the fact that they are liable to cause a more or less serious pneumonia. They have come to the conclusion that the real explanation of the behavior of Ascaris larvæ in rats and mice is that the worms are merely going through the same course as they do in their usual hosts, man and pig. The only essential difference is that in unsuitable hosts, such as rats and mice, the parasites are unable to complete their development to maturity, whereas, in human being and pigs, after their migration through the lungs and return to the alimentary tract they can continue their growth to the adult stage.

The fact that immature worms that had developed beyond any stage yet obtained from rats, mice, guinea pigs, or rabbits were recovered from a young goat and a lamb after having fed them eggs of the pig Ascaris and other experiments lend support to the common belief that *A. ovis* occasionally found in sheep is merely the pig Ascaris in a strange host. "In a scale of host adaptations we may, therefore, recognize three grades—rats, mice, guinea pigs, and rabbits in the lowest, sheep and goats in the intermediate grade, and pigs in the highest, with which we may also include human beings, if it be true that the Ascaris of man and of the pig are identical. . . .

"The symptoms shown by experimentally infected pigs at the time of the invasion of the lungs by the larvæ are frequently exactly similar to those exhibited by pigs suffering from so-called 'thumps,' a popular name for a serious condition of very common occurrence among pigs, and it is accordingly not improbable that Ascaris is an important factor in the production of 'thumps,' especially when it is considered how very commonly Ascaris occurs as a parasite of pigs."

The factors which bring about the hatching of the eggs have not yet been determined, the authors having been unable to cause more than a very small percentage of the eggs to hatch outside the body in vitro.

A list of 17 references to the literature is appended.

**Recent experiments on the life history of Ascaris lumbricoides,** F. H. STEWART (*Brit. Med. Jour., No. 3030 (1919), p. 102*).—The author first refers to the report of Ransom and Foster, previously noted (E. S. R., 38, p. 385), after which he reports several experiments with young pigs in continuation of the work previously noted (E. S. R., 39, p. 587).

Doses of 22,000 ripe eggs of *A. suilla* each administered to two 4-day-old pigs (A and B) and a dose of about 50,000 eggs to a pig (C), 2 months and 10 days old, resulted in the two former suffering from Ascaris pneumonia on the eighth day after infection, while the latter, or older pig, showed no sign of pulmonary trouble.

"Pig A was killed on the fourteenth day, and young forms of Ascaris measuring between 2.5 and 3.8 mm. [0.1 to 0.15 in.] were found in great numbers in the small intestine and cecum. Their heads had lost the appearance of the larval head and had taken on the adult head character. Pig B was killed on the nineteenth day, and although there can be no doubt that on the eighth day the lungs contained thousands of active larvæ, not a single worm was found in the stomach, small intestine, cecum, or colon. The nature of the feces found in the colon proved that the pig was not suffering from diarrhea

due to excessive infection, which might have accounted for the disappearance of the worms. Pig C was killed 31 days after infection, and again no worms were found in the intestine."

**On the development of Ascaris lumbricoides**, S. YOSHIDA (*Jour. Parasitology, 5 (1919), No. 3, pp. 106–115, pl. 1*).—This is a report of investigations conducted by the author at Osaka, Japan. Experiments are reported and discussed under the headings of development of uninjured fertilized eggs, noninfectiveness of unripe eggs, hatching place of eggs, migration of larvæ in the body of host, the fate of the larvæ in the body of the feeding animal, experiments on other mammals, experiments on immunity, the migrating power of the larvæ, human experiments with Ascaris larvæ, and morphological changes in the larvæ during development.

**Parasitic mange** (*Vet. Rev., 3 (1919), No. 2, pp. 185–194*).—This is a review of the more recent literature relating to the subject, in which 17 titles are dealt with.

**Practical methods of prophylaxis against worm infestations**, B. H. RANSOM (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 1, pp. 46–62*).

**Practical methods of treatment for worm infestation**, M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 1, pp. 24–45, fig. 1*).—This paper deals briefly with a dozen of the more important parasites affecting cattle, horses, sheep, swine, dogs, cats, and poultry.

**Tick eradication plans for 1919**, J. R. MOHLER (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 7, pp. 745–748*).

**Dips and dipping, I**, H. H. GREEN (*So. African Jour. Indus., 2 (1919), No. 5, pp. 410–418*).—A discussion of the work in South Africa of dipping against tick-transmitted diseases, life history of the tick, interval between dippings, efficacy of dips, and arsenite of soda.

**Bovine piroplasmosis in Switzerland**, B. GALLI-VALERIO and H. STALDER (*Schweiz. Arch. Tierheilk., 60 (1918), No. 10, pp. 471–477, fig. 1; abs. in Vet. Rev., 3 (1919), No. 1, pp. 50, 51*).—This is an account of piroplasmosis observed in cattle in the canton of Vaud. This is the first record of its actual occurrence in Switzerland, where it has long been suspected of occurring. *Piroplasma divergens* is thought to be the species present and *Ixodes ricinus* the transmitter.

**Atlas of the viscera, in situ, of the dairy cow**, G. S. HOPKINS (*New York: The Macmillan Co., 1919, pp. 23, pls. 10*).—This atlas has been prepared to meet the needs of the veterinarian for a concise and graphic exposition of the relations of the viscera of the cow.

**Investigations to determine the cause of certain sheep diseases in Colorado**, G. H. GLOVER, I. E. NEWSOM, and E. W. ALKIRE (*Jour. Amer. Vet. Med. Assoc., 55 (1919), Nos. 1, pp. 3–22; 2, pp. 128–146*).—A general discussion of losses of sheep in Colorado from disease.

**Feed given the pregnant ewe may affect the immunity of the newborn lamb to hemorrhagic septicemia** (*Iowa Sta. Rpt. 1918, pp. 18, 19*).—During the course of experiments in which potassium iodid was fed to pregnant ewes to determine whether it would prevent goitre in lambs, hemorrhage septicemia broke out in the paddock in which the lambs were confined and all were subjected to its ravages. It was found that in the lots where a very heavy iodin allowance and a medium allowance were given the death rate was extraordinarily high, whereas in the lot where no iodin was fed it was particularly low. Thus it appears that the addition of iodin to the mother's ration decreased the immunity of the lambs to hemorrhagic septicemia.

**Studies on the hyperimmunization of hogs against hog cholera**, M. DORSET, C. N. MCBRYDE, W. B. NILES, and J. H. RIETZ (*Jour. Amer. Vet. Med. Assoc.,*

*55 (1919), No. 3, pp. 259–280*).—These studies reported from the Bureau of Animal Industry, U. S. Department of Agriculture, were conducted for the purpose of determining whether improvements in the production of antihog-cholera serum could be made along the lines suggested by Holmes[1] for the preparation of antirinderpest serum, namely, hyperimmunization at the negative phase and hyperimmunization with diluted and laked blood.

The results obtained indicate that there is no evidence of a negative phase or state of hypersusceptibility to hog cholera following simultaneous inoculation and that hogs which are hyperimmunized within a short time after simultaneous immunization do not produce serum of satisfactory potency. As the ability of hyperimmunized hogs to yield a potent serum increases within certain limits with the interval between immunization and hyperimmunization, it is recommended that an interval of not less than seven weeks and preferably three months should be allowed to elapse between immunization and hyperimmunization. The ability of immune hogs to respond to hyperimmunization to the desired degree, when once acquired, is said to remain unimpaired for at least a year.

Hyperimmunization with virus blood diluted with 0.5 per cent citrate solution and with distilled water did not materially increase the antigenic properties of the virus blood.

**Salicylic acid as a remedy for chronic hog cholera**, D. J. Healy (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 6, pp. 633–638*).—In work at the Kentucky Experiment Station, the author has found salicylic acid a distinctly effective remedy in chronic hog cholera, although of no value whatever in the acute form of the disease.

**The blood pressure of the horse**, S. J. Schilling (*Vet. Alumni Quart. [Ohio State Univ.], 7 (1919), No. 1, pp. 245–256, figs. 3*).—"The ordinary type of sphygmomanometer as used in human practice is applicable in taking the blood pressure of the horse, mule, and ox. The normal diastolic pressure for the horse is from 40 to 50 mm. of mercury. The normal systolic pressure is from 90 to 100. The systolic pressure is subject to the widest variation; the diastolic pressure is more constant. The systolic pressure is higher in the colt than in mature animals. An increase in blood pressure is common in old age. Females have a slightly higher systolic pressure than males. Weight and condition as to flesh seem not to have any noticeable influence upon the blood pressure."

**Studies on the bacterial flora of the mouth and nose of the normal horse**, E. E. H. Boyer (*Jour. Bact., 4 (1919), No. 1, pp. 61–63*).—"The nose and mouth of the normal horse harbor a large flora of microorganisms. The great majority of these organisms are harmless saprophytes. Occasionally present are a few bacteria which may become pathogenic under certain conditions."

**A note in regard to the seasonal appearance of Anoplocephala mammilana**, H. P. Hoskins (*Cornell Vet., 9 (1919), No. 2, pp. 110, 111*).—The author records the occurrence of this rare horse tapeworm (*A. mammilana*) in two horses in addition to the cases previously reported (E. S. R., 40, p. 186).

**Note on the occurrence of Filaria papillosa**, W. H. Dalrymple (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 6, pp. 643–645*).—A note on the occurrence of *F. papillosa* in the aqueous humor of a horse's eye.

**The diagnosis of fowl cholera and fowl typhoid infections in domestic birds**, P. [B.] Hadley (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 2, pp. 186–192*).—This paper is based upon Bulletin 174 of the Rhode Island Experiment Station, previously noted (E. S. R., 40, p. 685).

[1] Indian Civ. Vet. Dept. Mem. [1912] No. 3, pp. 98–205.

Contagious epithelioma in chickens, E. Records (*Nevada Sta. Rpt. 1918, pp. 37, 38*).—A study of various affected birds received has shown three distinct conditions to be encountered which presented a clinical picture hard to distinguish: (1) The true contagious epithelioma due to the "scab-virus" infection, (2) a nonspecific type due to an infection with various microorganisms, and (3) a type in which in the conjunctival sacs and suborbital sinuses, and to some extent the throat, occur deposits of material distinguished from the pseudomembranes found in the other two types by their chalk-white color and being extremely loose or having no attachment. A number of birds showing types 1 and 2 were vaccinated during the year with quite satisfactory results. The indications are that type 3 is of rheumatic origin.

## RURAL ENGINEERING.

**Machine-made cement pipe for irrigation systems and other purposes,** G. E. P. Smith (*Arizona Sta. Bul. 86 (1918), pp. 71–171, pl. 1, figs. 37*).—This bulletin is a general treatise on cement pipe, its manufacture, characteristics, and applications. Descriptions are given of various machines used in pipe making, the details of making and laying, the dangers inherent in cement pipe making and in pipe lines, the testing of pipe and the results obtained, the design of pipe lines and structures, and the utility of cement pipe for various purposes.

With reference to pipe it is stated that the two general classes of pipe machines are those employing the tamping principle and the centrifugal or packerhead machines. The latter machines have greater speed and capacity per day and are especially adapted to small sizes of pipe. The purchase of a machine and equipment requires an investment of from $4,000 to $10,000. It is stated that handmade pipe is extremely variable in quality. Tamping alone does not produce a smooth interior, and the pipe should be washed inside with neat cement. Greater strength can be secured by increasing the thickness of the pipe wall and by using a wet consistency of the mortar. It is stated that machine-made pipe is safe when subjected to hydrostatic heads up to 25 ft., and that the strength of handmade pipe of good quality is about one-half as great. Wet-cast pipe can be designed to carry water under heads of somewhat over 100 ft. Machine-made cement pipe up to 20 in. in diameter is safe in trenches under 10 ft. of back fill and the smaller sizes are safe for much greater depth. Handmade pipe 16 in. in diameter, of good quality, can be used under 10 ft. of earth. Machine-made pipe is practically impervious. Good handmade pipe washed inside with neat cement is nearly impervious and becomes entirely so in time. It is stated that in design the value of $n$ in Kutter's formula should be taken as 0.013.

Cement pipe of good quality is considered in all respects the equal of vitrified clay pipe for use in sewer lines. "In Arizona, where the cost of cement pipe is much less than that of clay pipe, the cement pipe should be employed. Cement pipe likewise should have the preference for farm and road culverts. When properly made and placed, it is more durable, has a greater carrying capacity, and is much cheaper than corrugated iron pipe. Cement pipe, if used for draintile in alkaline areas, should be of great density and impervious."

**Composition of the waters of the inter-mountain region,** J. E. Greaves and C. T. Hirst (*Jour. Indus. and Engin. Chem., 10 (1918), No. 12, pp. 1001–1004, figs. 4*).—Analyses made at the Utah Experiment Station of the waters of 58 Utah streams, most of which are used for irrigation, are reported and discussed with special reference to their suitability for this purpose. In most cases samples were taken monthly during the irrigation season.

The waters show considerable variation in the amount and character of the soluble salts. Some are free from excess of objectionable constituents; others, good at their source, dissolve large quantities of alkali in their course. Viewed in the light of Hilgard's interpretation, 13 of the streams contain amounts of alkali which make them dangerous for irrigation, "or, if interpreted in the light of Forbes' experience, only two, but according to the work of the Bureau of Soils [of the U. S. Department of Agriculture] none should be condemned." Caution in the use of the waters is, however, advised.

**Surface water supply of Pacific slope basins in California, 1916** (*U. S. Geol. Survey, Water-Supply Paper 441 (1918), pp. 330+XXXVI, pls. 2*).—This report, prepared in cooperation with the State of California, presents the results of measurements of flow made on streams in Pacific coast drainage basins during the year ended September 30, 1916.

**Laying out fields for tractor plowing**, H. R. Tolley (*U. S. Dept. Agr., Farmers' Bul. 1045 (1919), pp. 40, figs. 33*).—This embodies descriptions of methods found best suited to their conditions and recommended by a majority of several hundred tractor owners who have reported their methods and experiences. The methods in general use are divided into two general classes: (1) Those in which the plows are lifted and no plowing is done across the ends, and (2) those in which the plows are lifted in the ground while going across the ends. The advantage of plowing by the methods of the first class are that the short, awkward turns are eliminated, except in some cases at the beginning and the ending of the lands, and usually less space will be left at the corners to be plowed out with horses. It is considered generally possible also to do a little higher quality of plowing if the plows are lifted at the ends. The advantages of the methods of the second class are that little or no time is lost in traveling with the plows out of the ground and that ordinarily the number of dead furrows and back furrows will be considerably less. Taking the country as a whole, it is the opinion that the methods by which the plows are idle across the ends are the more popular, but a large number of farmers have a decided preference for those by which the plows are kept in the ground continuously.

**New labor-saving machinery for harvesting grain**, W. R. Porter (*North Dakota Sta. Bul. 128 (1919), pp. 3–13, figs. 18*).—This bulletin describes four distinct types of new machinery for saving labor and harvesting and thrashing grain in use in North Dakota at the present time, as follows: The Stewart bundle loader, the Paulson shock bucker, the Fisher motor bundle truck, and the Graham-Roach stacker.

The bundle loader is designed to load the shocks directly on the wagon. It is drawn by four horses and requires one man as operator. It is stated that one machine will load on wagons all the bundles that an ordinary separator can thrash, that it gathers the grain cleaner than hand pitchers and shells but very little grain in its operation, and that a saving of two teams and 11 men can be effected by its use. An improvement of the machine loads and carries the bundles direct to the separator.

The shock bucker is intended to pick up a load of shocks in much the same manner as the sweep rake and is drawn by four horses. When loaded the sweeps are lifted off the ground, the machine runs on two wheels, and the load of bundles is dumped on the ground beside the separator. It does not shell any grain, and gathers up the loose stuff. "It is claimed that two men with two machines and eight horses can bring in all the grain that an ordinary separator can handle, so that five men with two of these machines and four teams can keep an ordinary separator running as well as 10 teams and 20 men when the grain is all forked by hand and hauled in on wagons. Two of these ma-

chines are claimed to save the labor of 15 men and 6 teams in ordinary thrashing. This machine is a decided advance over the Stewart bundle loader, as it supplies the thrashing separator with the shocked grain much more economically."

The object of the motor bundle truck is to gather up shock grain and deliver it at the thrashing machine. "It is claimed that seven men with two of these machines can do exactly the same work as a crew of 20 men and 10 teams would accomplish in ordinery thrashing practice, thus saving the labor of 13 men and 10 teams daily. No horses whatever are required with this machine, as it is a large motor truck which will hold about two tons of hay or bundles. The bundles are loaded on the machine by a device on the front of the truck. This loading mechanism is run by the motor of the truck but can be started and stopped independent of it."

When the stacker is used, the binding device is removed from the ordinary harvester, and the grain elevator is extended and raised to a much greater height to deliver the grain directly into the stacker. The stacker and harvester are each drawn by two horses. The capacity is about 2,500 lbs. of mature wheat or other grain as it comes direct from the elevator of the harvester. It is stated that the grain in these stacks seems to cure much better than when in shocks. "When this machine is used in place of the binder it eliminates 90 per cent of the cost for twine, as but a small amount is used to tie the stacks. It requires the same amount of labor to stack and tie the stacks as to shock the grain behind the binder. This machine has the further advantage that it removes the weed seed from the land, such as wild oats." It is also claimed that the stacker saves practically all the grain lost by use of the ordinary self-binder.

**A study of the factors governing the efficiency of distribution and rate of discharge of spray nozzles,** H. L. CRANE (*West Virginia Sta. Bul. 169 (1919), pp. 3–65, figs. 24*).—A rather extensive review of work by others bearing on the subject is given, and the results of a study of the capacity of different types of nozzles and of their efficiency in distribution is reported. An attempt was also made to determine, if possible, some of the principles of nozzle construction which influence their rate of discharge and distribution.

With reference to factors influencing the distribution of the spray, it was found that increasing the size of the outlet orifice increased the angle of discharge and widened the ring of spray, but so far as could be told by observation did not increase the size of the spray particles. High pressures gave the better distribution, more perfect cones, and smallest particles. Up to a certain point the angle of the discharge was increased and the width of the ring decreased with the pressure, but the size of the spray particles became smaller as the pressure was increased. The results indicate that for each nozzle there is an optimum pressure at which it works best, and any additional pressure results in partial loss of energy. As the depth of the eddy chamber is increased the angle of discharge and the width of the ring is decreased and the size of the spray particles is increased. The results seem to indicate that increasing the width of the eddy chamber increased the angle of discharge and the width of the ring and also breaks up the spray particles. The angle at which the supply holes in the directing disk were drilled exerted a great influence on the angle of discharge, width of ring, and size of drops. The smaller the angle of the supply holes the wider was the angle of discharge and the width of the ring and the smaller the drops of spray. A central supply hole in the directing disk changed the spray discharged from a hollow cone to a solid cone, narrowed the angle of discharge, and in some cases increased

considerably the size of the drops. The greater the number of supply holes at the edge of the directing disk, the greater was the decrease in the angle of discharge, the narrower the width of the ring, and the larger the drops. One supply hole was not sufficient as a one-sided cone was produced. Two supply holes if located properly and of the right dimensions produced a spray that was perfectly distributed. The presence of a post on the directing disk decreased the angle of discharge, narrowed the width of the ring, and produced a more evenly distributed spray. A thick disk was found to reduce greatly the angle of discharge, narrow the width of the ring, and increase the size of the spray particles. Burrs in the outlet orifice, orifices that were oblong in shape or not properly centered, disks that fitted loosely in the caps, or cracks near the holes in the directing disk were responsible for a great deal of the imperfections found in this study since they produced an unevenly distributed spray.

With reference to factors influencing the rate of discharge, it was found that an increase in the area of the outlet orifice gave a greater rate of discharge. The increase per unit of area was found to vary inversely with the area of the orifice. An increase in pressure resulted in a greater rate of discharge. No general rule can be given for the increase for all nozzles except that as the pressure is doubled the discharge is greater by 1.4 times. In most cases a deeper eddy chamber increased the rate of discharge, which varied with the size of the outlet orifice. Exceptions were found where a deeper eddy chamber reduced the rate of discharge to a certain point, and then an increase began to show. Widening the eddy chamber was found to increase only slightly the rate of discharge, the rate of increase varying inversely with the size of the outlet orifice. Within certain limits, the greater the area of the supply holes in the directing disc the greater was the rate of discharge. A supply hole placed in the center of the directing disc was found to have much more influence on the rate of discharge than did a corresponding area located at the outer edge. An increase in the angle of the supply holes in the directing disc gave a greater rate of discharge, the increase varying with the size of the outlet orifice. Placing a post on the center of the directing disc just under the outlet orifice increased the rate of discharge. A thick discharge disc diminished the capacity of the nozzle. An angle on the nozzle, or a strainer just behind the directing disc, was found to reduce the rate of discharge by increasing friction. Burrs in the outlet orifices, or orifices that were not perfectly smooth and round, greatly influenced the rate of discharge, the amount depending on the imperfection.

**Influence of silo-wall construction on freezing of silage** (*Iowa Sta. Rpt. 1918, p. 9*).—Temperature readings have been taken for five winter seasons in three silos on the college campus constructed of wood stave, monolithic concrete, and hollow tile. In each silo thermometers were placed at the inside of the north wall and also in the central part of the silo. The purpose of the work was to find out which type of silo wall afforded the greatest protection from freezing.

The results show that during cold weather the temperature at the inside of the north wall of the silo is only a little warmer than the outside temperature with any of the silo walls tested. The difference between mean temperatures at the north wall in different silos was seldom as much as 2° F. and was not always in favor of the same type of silo. It is concluded that there is no practical difference between the insulating properties of these three types of silo wall, and that under the same conditions the same amount of freezing may be expected in them.

**The Puyallup laying house**, G. R. SHOUP (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1919), No. 1, pp. 6–16, figs. 7*).—This article describes, illustrates, and gives plans for a laying house considered ideal for western Washington conditions. It has been attempted to construct a building which will provide, besides roosting and nesting quarters, all necessary equipment to make conditions inside the building during the fall and winter a duplicate of those prevailing during the spring when production is normally highest.

**Poultry house equipment**, G. R. SHOUP (*Washington Sta., West Wash. Sta. Mo. Bul., 7 (1919), No. 2, pp. 26–32, figs. 4*).—This article describes and illustrates the construction of furnishings and equipment for the efficient handling of laying pullets.

**Trap nests, open nests, and trolley carriers**, G. R. SHOUP (*Washington Sta. West. Wash. Sta. Mo. Bul., 7 (1919), No. 3, pp. 42–49, figs. 3*).—This article gives plans and descriptions of trap nests, open nests, and trolley egg carriers, considered adapted to western Washington conditions.

## RURAL ECONOMICS.

**Report of committee appointed by the Secretary of Agriculture to consider the subject of land economics as one of the divisions of research work of the proposed Bureau of Farm Management and Farm Economics** (*U. S. Dept. Agr., Off. Sec. Circ. 138 (1919), pp. 8*).—This outline for investigations by the proposed Bureau of Farm Management and Farm Economics includes land resources, land values, land ownership and tenancy, land settlement and colonization, and land policies. The report contains recommendations for cooperation between the Office of Farm Management and other bureaus and departments of the Government in the classification of lands from the standpoint of their economic utilization. It also points out, for special emphasis, questions of the economic causes which prevent areas of land suitable for agriculture from being used, the good and evil of tenancy as a method of holding land, the settlement of undeveloped regions by colonization under governmental direction, and the most economical methods of using these areas while in public ownership.

**Report of committee appointed by the Secretary of Agriculture to consider the subject of farm-life studies as one of the divisions of research work of the proposed Bureau of Farm Management and Farm Economics** (*U. S. Dept. Agr., Off. Sec. Circ. 139 (1919), pp. 8*).—The list of topics for study submitted by the committee includes rural home life, opportunities for social contact in typical rural communities, the relation of educational and religious institutions to farm-life problems, problems relating to geographical population groups, rural organizations (without definite geographical boundaries), social aspects of tenancy and landlordism, social aspects of various types of farm labor, the relation of various forms of disability to farm-life problems, the social consequences of local disasters due to natural causes, and the social consequences of thrift and agencies for promoting thrift.

**Rural and forest surveys**, P. CAZIOT (*Expertises Rurales et Forestières. Paris: J. B. Baillière & Sons, 1917, pp. 396, figs. 22*).—This is one of the volumes of the Encyclopèdie Agricole, published under the direction of G. Wery. It is a technical guide for the valuation of various types of rural property and improvements, forests, and vineyards.

**Tenancy in an ideal system of landownership**, R. T. ELY and C. J. GALPIN (*Amer. Econ. Rev., 9 (1919), No. 1, Sup., pp. 180–212*).—Part A is a considera-

tion of some of the good aspects of tenancy and of the prerequisites for an ideal system of tenancy. Part B is the report of investigations recently noted (E. S. R., 40, p. 892).

**The Irish land acts: A short sketch of their history and development,** W. F. BAILEY (*Dublin: Govt., 1917, pp. 48, pls. 8*).—The various Irish land acts of the period 1860–1909 are discussed in chronological order, showing the advantages and evils and the progress under each. The author describes the establishment of the Congested Districts Board and statutes dealing with congestion, the provision of allotments of land and dwellings for agricultural laborers, and miscellaneous details.

**Method of colonization,** O. SCHULZ (*Ansiedlungs-Wegweiser. Berlin: Deutsche Landbuchhandlung, 1918, pp. 64*).—This booklet sets forth various means of acquiring capital and applying it to the purchase of agricultural small holdings in various sections of the German Empire.

**[Women's work on the land in England and Wales]** (*Jour. Bd. Agr. [London], 25 (1918), No. 7, pp. 785–839, pls. 7*).—This number contains a series of eight articles descriptive of the official organization of women farm labor, the origin and work of the Women's Land Army, the training of women on the land, and women's institutes in the United Kingdom.

**Cooperation in the new world,** L. SMITH-GORDON (*Better Business, 4 (1919), No. 3, pp. 168–185*).—This article deals with the status of mortgage credit in the United States, particularly with the inception and progress of the Federal farm loan system. The information has been largely derived from the report of the United States Commmission to Europe in 1913 (E. S. R., 30, p. 492), the text of the Federal Farm Loan Act (E. S. R., 35, p. 104), a summary of the first official report of the American Bankers' Association[1], and the report of the Secretary of the Treasury for 1918.

**Cooperative buying and selling,** J. L. TENNANT (*Agr. Gaz. Canada, 6 (1919), No. 5, pp. 449–455*).—Under this title are included notes on the status of farmers' cooperative activities in Prince Edward Island, New Brunswick, Quebec, Ontario, and British Columbia.

**[Agricultural cooperative societies of the Union of South Africa],** J. RETIEF (*Union So. Africa Dept. Agr. Rpt. 1917–18, pp. 131–144*).—These pages report the progress of the cooperative movement and the position of individual societies in the Union of South Africa in 1917–18 continuing previous information (E. S. R., 40, p. 93).

**[Agricultural associations in liberated regions],** E. DE WARREN (*Mission Assoc. Agr. [Paris] Brochure No. 2 (1919), pp. 104*).—The Mission of Agricultural Associations of the Office of Agricultural Reconstruction of the Ministry of Liberated Regions outlines cooperative societies adaptable to various needs and conditions of agriculturists in the liberated regions of France, with several constitutional models, and suggests means for acquiring capital and loans and collecting upon war damages.

**Effects of the great war upon agriculture in the United States and Great Britain,** B. H. HIBBARD (*Carnegie Endowment Internat. Peace, Div. Econ. and Hist., Prelim. Econ. Studies War No. 11 (1919), pp. IX+232, figs. 8*).—A compilation of data largely from official sources, showing live-stock and crop production and prices and exports of the United States in the period 1914–1918, and summarizing the policies and results of the work of the Council of National Defense, the U. S. Food Administration, and the U. S. Department of Agriculture in aiding the production and distribution of food. The domestic production and trade in agricultural products in the United Kingdom after the outbreak of

[1] Jour. Amer. Bankers' Assoc. (1917), Sept.

the war, and the activities of the government, particularly of the Ministry of Food, and the Board of Agriculture and Fisheries in the control of consumption and price of food, are also reviewed. Numerous charts and statistical tables are included.

**Agricultural France and the war**, C. CHAUVEAU (*La France Agricole et la Guerre. Paris: Baillière, vol. 1, 1916, pp. 302; vol. 2, 1918, pp. VII+322*).—In Volume 1 the author has included articles that were published in French periodicals at intervals during 1916, relating principally to the assembling of small and scattered holdings, but dealing also with syndical associations, long-term agricultural credit, registry of the survey of lands, mechanical cultivation, and forests and meadowlands of France and the French colonies. Volume 2 contains a digest of legislation relating to, and various legal phases of, the same topics.

**Agricultural Serbia and her democracy**, M. ZÉBITCH (*La Serbie Agricole et Sa Démocratie. Paris: Berger-Levrault, 1917, pp. 84*).—A brief historical sketch of land-holding systems and an account of educational, economic, and social phases of Serbian agriculture. The author includes also discussions of the effects of Turkish and Austrian occupation of the country, the form of government in Serbia, and the outlook for future development.

**Agriculture in early Latium**, T. FRANK (*Amer. Econ. Rev., 9 (1919), No. 2, pp. 267–276*).—The author discusses the evolution of the Roman Compagna and tradition and history connected with it to show that in the sixth century it supported a dense population, enjoying a remarkable agricultural prosperity, before the thin soil was worn out and eroded away and the region became an arid waste.

**Monthly Crop Reporter** (*U. S. Dept. Agr., Mo. Crop Rptr., 5 (1919), No. 6, pp. 53–60*).—This number shows the estimated farm value of important products for May 15 and June 1, the average prices received by producers of the United States, range of prices of agricultural products at important markets, the United States crop summary for June, and estimated crop conditions June 1, 1919, with comparisons. It contains also a cotton report for May 25 and various data regarding conditions of crops. It reports corn movement by grades, wheat movement both by varieties and grades from November 1, 1917, to July 14, 1918, and the proportion of each important feed stuffs as consumed in each month.

**Montana, 1918** (*Helena: Dept. Agr. and Publicity, 1918, pp. 245, figs. 130*).—This continues information previously noted (E. S. R., 39, p. 796).

**Census of agricultural resources of New York, 1917–18** (*Albany: N. Y. State Food Com., 1919, pp. 69*).—The results of the census of 1917, taken by order of the New York State Food Supply Commission, and that of 1918, taken by order of the New York State Food Commission, are published here. The data were secured from blanks placed in the hands of teachers, county agents, and others to be filled out. Enumerations of farm population, farm labor, conveniences, machinery, and amount of fertilizer used, and information relating to land in New York and uses made of it, acreage and yields of crops, and numbers of live stock are given.

**Annual statistical report of the New York Produce Exchange for the year 1918** (*Ann. Statis. Rpt. N. Y. Produce Ex., 1918, pp. 137*).—This continues information previously noted (E. S. R., 39, p. 690).

**Farmers' Market Bulletin** (*North Carolina Sta., Farmers' Market Bul., 6 (1919), No. 28, pp. 24, fig. 1*).—This number contains the usual list of products which North Carolina farmers have for sale, also a brief note on cooperative live-stock marketing, by C. S. Jones.

**Ohio agricultural statistics, 1916–17 and 1917–18** (*Ohio Agr. Statis., 1916–17, pp. 78; 1917–18, pp. 86*).—These volumes continue information previously noted (E. S. R., 37, p. 191).

**[Agricultural statistics of Uruguay]**, R. B. WILSON (*An. Estadís. Agr. [Uruguay], 1917–18, pp. XLV+609*).—Statistics for 1917–18 are given, continuing the information previously noted (E. S. R., 38, p. 896). The index is inserted in this number in Spanish, French, and English. In the appendix are included data for 1916 relating to number and extension of farms, stock of cattle and other live stock, machinery and implements, and bee and silk culture.

**Imports, exports, and supplies of agricultural produce of the United Kingdom during the war** (*Jour. Bd. Agr. [London], 25 (1919), No. 12, pp. 1462–1474*).—A summary is given of the returns for the year 1918 relating to prices and supplies of agricultural produce in the United Kingdom, with special reference to imports and with comparisons through the period 1914–1918.

**[Agricultural statistics]** (*Statis. Abs. Brit. Self-Gov. Dominions [etc.], 52 (1900–1914), pp. 318–379; 53 (1901–1915), pp. 328–389*).—These pages of these volumes continue to date the information on agricultural production, imports, and exports for the British self-governing dominions, crown colonies, possessions, and protectorates previously noted (E. S. R., 33, p. 295).

**[Agricultural statistics of Canada]** (*Canada Yearbook, 1917–18 pp. 166–230*).—Among the data included in these pages are those relating to area and yield of field crops, number and value of live stock, land values, wages, manufacturing of agricultural products, prices, and miscellaneous agricultural statistics.

**Report of the Canada Food Board** (*Rpt. Canada Food Bd., 1918, pp. [5]+87, figs. 5*).—This report of February 11 to December 31, 1918, sets forth the Canadian policy of food control and the work of the Food Board as affecting supplies of important food commodities.

**[Agricultural statistics of the Union of South Africa, 1914–15 and 1915–16]** (*Statis. Year Book Union So. Africa, Nos. 3 (1914–15), pp. 4–17, 46–55, 134–137; 4 (1915–16), pp. 8–22, 40–49, 116–132*).—The first of these numbers of the yearbook, No. 1 of which was previously noted (E. S. R., 33, p. 789), gives statistics of urban and rural population of the Cape of Good Hope for the years 1910 to 1914, inclusive, and statements, for the Union as a whole, of numbers of animals, exports of agricultural and pastoral products, and the transactions of agricultural cooperative societies. In the second, population enumerations for all districts of the Union, according to the 1911 census, and information in regard to agriculture more detailed than in the preceding report are given.

## AGRICULTURAL EDUCATION.

**Agricultural education, 1916–1918**, C. H. LANE (*U. S. Bur. Ed. Bul. 44 (1918), pp. 40*).—This is the usual review of progress in agricultural instruction, in 1916–1918, in secondary and elementary schools, in agricultural colleges, agricultural extension and short courses, and the Graduate School of Agriculture; of agricultural education at meetings; the educational work of the U. S. Department of Agriculture; and of the principal developments in agricultural education in foreign countries. The bulletin represents advance sheets from the Biennial Survey of Education in the United States, 1916–1918 (E. S. R., 39, p. 392).

**Statistics of agricultural and mechanical colleges, 1916–17**, B. F. ANDREWS (*U. S. Bur. Ed. Bul. 41 (1918), pp. 43*).—This is a compilation, from official sources, of statistics of the land-grant colleges with reference to faculties, students, courses of study, value of funds and equipment, revenues, additions to equipment, disbursements of Federal funds, etc., for 1916–17.

**[Agricultural education and research in the Province of Quebec, 1917–18]**, J. E. CARON (*Rpt. Min. Agr. Prov. Quebec, 1918, pp. VIII+182, pls. 26*).—This report of the department of agriculture of the Province of Quebec includes detailed information concerning the activities of the agricultural and domestic science education institutions, experimental stations (demonstration fields), school gardens and extension work, etc., under its control.

**Agricultural education and agricultural development in America**, A. E. V. RICHARDSON (*Melbourne, Australia: Govt. [1918], pp. 135, pls. 19, fig. 1*).—This report has been discussed editorially (E. S. R., 40, p. 107).

**[American agriculture]**, A. E. V. RICHARDSON (*Jour. Dept. Agr. Victoria, 16 (1918), Nos. 5, pp. 257–275, figs. 13; 6, pp. 339–354, figs. 6; 7, pp. 385–396; 8, pp. 463–468; 9, pp. 555–568, figs. 11; 10, pp. 577–591, figs. 10; 11, pp. 658–668, figs. 6*).—This series of articles, based on the six months' visit of investigation in the United States and Canada, noted above, consists of (1) a report on agricultural education methods and agricultural research work in the State of California; and (2) notes on the organization and work of the agricultural colleges and experiment stations in Utah, Colorado, Kansas, Iowa, Illinois, and Ohio; the Ohio State department of agriculture; the U. S. Department of Agriculture; the essential features in the organization of agricultural education of college grade in the United States; the organization of agricultural instruction of secondary grade, including the home project principle and the cooperation of Federal and State Governments for the promotion of vocational training in agriculture in the United States; agricultural production in Canada; agricultural education in Quebec and Ontario; the Dominion department of agriculture and experiment farms; the Ontario department of agriculture; and extension work in the United States.

**[Opportunities in agriculture for disabled soldiers, sailors, and marines]**, W. J. QUICK (*Fed. Bd. Vocat. Ed., Rehabil. Ser., 1919, Nos. 21, pp. 14, figs. 3; 26, pp. 22, figs. 5*).—These publications outline the opportunities in farm management and general farming, respectively, as vocations for disabled soldiers, sailors, and marines.

**Outline of plans for vocational education in Colorado under the Smith-Hughes Act** (*State Bd. Vocat. Ed. [Colo.], Vocat. Bul. 1 (1918), pp. 31*).—This is an outline of the plans for the promotion of vocational education in Colorado for 1918–19. The text of the State act accepting the provisions of the Smith-Hughes Act is included.

The State Board of Agriculture is designated as the State Board for Vocational Education. Since during the year 1918–19 the State director of vocational education spends only one-half of his total time in the supervision of vocational agriculture, an arrangement has been made whereby special supervisors from the departments of agronomy and animal husbandry of the Colorado College will be loaned to inspect all schools and classes in agriculture twice during the year and a specialist in home economics from the extension service of the college to supervise vocational schools and classes of home economics approved for Federal aid.

It is provided that all classes in teacher training in agriculture and home economics will be conducted in the agricultural college. Four-year type courses in vocational agriculture and home economics and 4-year teacher-training courses in agriculture and home economics are outlined.

**Outline of plans for the cooperation of the State Board of Education with the Federal Board for Vocational Education for vocational education in Idaho, year 1918–19, also an act accepting the provisions of the Smith-Hughes Act** (*Idaho Bul. [State Bd.] Ed., 5 (1919), No. 5, pp. 30*).—The plans for the administration and supervision of vocational education in Idaho for 1918–19, including the training of vocational teachers, are outlined. The University of Idaho has been designated as the institution to conduct all classes in teacher training in agriculture and home economics. Outlines are included of the 4-year teacher-training courses in vocational agriculture and home economics, of a 4-year course in vocational agriculture for high schools as a type of the course that will be required, and of a suggested 4-year course in vocational home economics.

**Administrative boards and officers, approved plans of the State for vocational education, Federal and State law, 1918–19** (*[Iowa State Bd. Vocat. Ed.], Vocat. Ed. Bul. 2 [1918], pp. 46*).—This bulletin contains a detailed outline of the approved plans for vocational education in Iowa for 1918–19, and the text of the Federal and Iowa State laws for vocational education.

**Plan for the cooperation of the Kansas State Board of Education with the Federal Board for Vocational Education, 1918–19** (*Kans. Dept. Ed., Vocat. Ed. Bul. 2 (1918), pp. 38*).—This plan supplants the one previously noted for 1917–18 (E. S. R., 40, p. 395). The texts of the Federal and Kansas State acts relating to vocational education are included.

**Massachusetts Board for Vocational Education: Plans of Massachusetts for year 1918–19** (*Bul. Bd. Ed. Mass., No. 10 (1918), pp. 98, figs. 2*).—A comparative statement is given, by years, of the distinctively agricultural and nonagricultural instruction in the county agricultural school and the high-school department, respectively. In the former, 80 per cent including 50 per cent in project study and work and 30 per cent in related study), and in the latter, 50 per cent of the students' time is devoted to strictly agricultural subjects, and 20 per cent and 50 per cent, respectively, to nonagricultural or cultural and good-citizenship training. The differences in the method of instruction followed in the school and the department are also comparatively stated.

Suggested types of short unit courses in vocational home economics on progressive and nonprogressive plans of organization are briefly indicated.

The proposed percentage use of funds as to training teachers is 20 per cent each for agricultural teachers, supervisors, and directors, industrial and trade teachers, and household arts teachers. The tentative plan for training vocational teachers of agriculture, just put into practice, is briefly outlined and includes the training of teachers in service. A tentative scheme for training teachers of vocational home making is given in tabular form, together with an explanation.

**Plans for the administration of the Smith-Hughes Act for vocational education in the State of South Dakota: Agriculture** (*Pierre, S. Dak.: State Bd. Vocat. Ed. [1919], pp. 12*).—This pamphlet outlines the plans for vocational agricultural education in South Dakota under the Smith-Hughes Act for 1918–19. It is provided that 75 per cent of a 1-year vocational agricultural course in a high school shall be devoted to instruction in agriculture, 60 per cent of a 2-year course, and at least 50 per cent of a 3 or 4-year course. The related work and practical work shall in no case be given for less than 90 minutes each per day. Suggested outlines of a 4-year and a 1-year vocational agricultural course are included.

**Plans for the administration of the Smith-Hughes Act for vocational education in the State of South Dakota: Home economics** (*Pierre, S. Dak.: State Bd. Vocat. Ed. [1919], pp. 8*).—This is an outline of the plan for voca-

tional home economics education in South Dakota under the Smith-Hughes Act for 1918–19. It is planned that in the vocational home economics course in the high school at least half the time shall be devoted to practice work and related subjects. Outlines are given of the 4-year and 2-year home economics courses for the vocational schools.

**The training of teachers of vocational agriculture**, W. G. HUMMEL (*Fed. Bd. Vocat. Ed. Bul. 27 (1919), pp. 47*).—The author discusses the qualifications and training desirable for teachers of vocational agriculture, the necessity for such qualifications, the special facilities and conditions needed in order to carry on such training successfully, the training of special teachers of agriculture, the certification of teachers, the training of teachers in service by means of itinerant teaching, agricultural teachers' meetings and conferences, professional improvement projects, and the foundation for the training of teachers in service, viz, cooperation between the agricultural teacher-training institution and the supervisor of agricultural education in a State.

**Vocational education: Bibliography of Government publications suitable for use of agriculture classes in elementary and secondary schools**, W. T. SKILLING (*Cal. State Bd. Ed. Bul. 23B (1919), pp. 26*).—This is a bibliography of Farmers' Bulletins of the U. S. Department of Agriculture, with brief descriptions, topically arranged.

**Agriculture in Ohio elementary schools.—A manual for teachers of grades 7 and 8**, F. E. HEALD and A. DILLE (*[Columbus, Ohio]: State Dept. Pub. Instr., 1919, pp. 178*).—The material outlined in this manual, which is arranged in seasonal sequence, includes in each year one main crop and one principal animal study, while poultry and gardening lessons recur throughout the entire two years. The subject matter for one year is not planned to be more elementary than, or prerequisite for, the other. It is recommended that in the smaller schools the two grades should be combined for agriculture, and the two years' work done in alternate years. Each lesson suggests problems, sources of information, illustrative material, class exercises, practical exercises or projects, and correlations.

**Laboratory manual in field crops**, C. C. FARR (*New York: The Macmillan Co., 1918, pp. X+63, pl. 1, figs. 5*).—A series of practicums in field crops, intended to equip the high-school student as a "practitioner agriculturist."

**Garden crops: Production and preservation**, L. S. IVINS (*Chicago: Rand McNally & Co., 1919, pp. 335, figs. 112*).—This book is intended primarily as a textbook for schools below the tenth grade, but may be found useful also by senior high schools or special vocational departments desiring a less advanced course in gardening, as well as by individuals interested in the subject. Section 1 of the text discusses the production of the most important garden crops grown in this country and presents problems and projects for classroom and outdoor work. Section 2 tells how such crops may be preserved and stored. Outlines for study and for home and community work are also included in most of the chapters of the first two sections. Section 3 consists of suggestions to teachers on lesson assignments, projects and problems, types of gardens, school exhibits of garden crops, score cards, suggestive record and report forms, etc.

**Suggestions for the study of weeds in agriculture in the elementary schools**, F. T. ULLRICH (*Bul. State Norm. School, Platteville, Wis., 15 [1919], No. 4, pp. 22, figs. 12*).—Suggestions are offered to teachers for the selection and organization of information on weeds.

**Forest study in the primary grades**, E. R. MOSHER (*[Lansing, Mich.]: Pub. Domain Com. Mich. [1918]. pp. 76, figs. 42*).—According to the author this publication is primarily intended to stimulate and assist the teacher by giving

a broader viewpoint of the subject and showing something of the educative value of forest materials for use in the schoolroom; also to furnish suggestions and subject matter adapted to the child mind. In order to illustrate methods of teaching, the material is arranged successively in topical subjects—in rhyme and story, in question form, making a direct appeal to observation and experience, and in cultural selections offered as helps for the teacher.

## MISCELLANEOUS.

**Annual Report of Idaho Station, 1918** (*Idaho Sta. Bul. 113 (1918), pp. 46*).—This contains the organization list, reports of the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and financial statements for the Federal funds for the fiscal year ended June 30, 1918, and for the remaining funds for the fiscal year ended December 31, 1918.

**Annual Report of Iowa Station, 1918** (*Iowa Sta. Rpt. 1918, pp. 62, figs. 3*).—This contains the organization list and a report by the director on the work of the station, including a financial statement for the fiscal year ended June 30, 1918. The experimental work recorded is for the most part abstracted elsewhere in this issue.

**Annual Report of Nevada Station, 1918** (*Nevada Sta. Rpt. 1918, pp. 53, figs. 8*).—This contains the organization list, a report of the director on the work of the station, departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue, a list of the publications of the year, and a financial statement for the fiscal year ended June 30, 1918.

**Annual Report of South Dakota Station, 1918** (*South Dakota Sta. Rpt. 1918, pp. 27*).—This contains a report by the director on the organization, work, and publications of the station, a financial statement for the fiscal year ended June 30, 1918, and departmental reports, of which that of the entomologist and portions of that of the horticulturist are abstracted elsewhere in this issue.

**Thirtieth and Thirty-first Annual Reports of Texas Station, 1917 and 1918** (*Texas Sta. Rpts. 1917–18, pp. 40, pl. 1*).—This contains the organization list, a financial statement for the Federal funds for the fiscal years ended June 30, 1917, and June 30, 1918, and for various State funds for the fiscal years ended August 31, 1917, and August 31, 1918, a report of the director on the work of the station and the various substations, and a list of the station publications available for distribution.

**Monthly Bulletin of the Ohio Experiment Station** (*Mo. Bul. Ohio Sta., 4 (1919), No. 5, pp. 139–167, figs. 14*).—This contains several articles abstracted elsewhere in this issue, together with the following: Methods of Feeding and Feeds for Chicks, by W. J. Buss; Apple Blotch.—A Serious Fruit Disease in Ohio, by A. D. Selby; and Notes.

**Monthly bulletin of the Western Washington Substation** (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1919), Nos. 1, pp. 20, figs. 11; 2, pp. 21–36, figs. 4; 3, pp. 37–52, figs. 3*).—These numbers contain several articles abstracted elsewhere in this issue, and brief articles as follows:

No. 1.—Proposed Plan for Buying and Distributing Breeding Sheep for Western Washington Farm Flocks, by W. A. Linklater; Apple and Pear Scab, by A. Frank; and Potato Planting, by J. L. Stahl.

No. 2.—Establishing a Farm Flock, by W. A. Linklater; Late-Sown Crops, by E. B. Stookey; Rose Diseases and Insect Pests and Their Control, by A. Frank; and Grow More Squash, by J. L. Stahl.

No. 3.—What Makes Prime Berries? by J. L. Stahl; Testing Cereal Varieties, by E. B. Stookey; and Insect Pests of the Garden and Their Control, by A. Frank.

# NOTES.

**Florida Station.**—A tract of land at Lake Aldred has been selected as a site for the new citrus substation. Funds for the erection of a building and the maintenance of the substation for the present biennium have been subscribed by citrus growers of Polk County, and a sum of $10,000 has been placed in the hands of the board of control.

Cooperative work with pineapple growers of St. Lucie County is being begun with a view to studying the best means of growing pineapples and controlling certain pineapple diseases.

**Purdue University.**—*School and Society* announces that a general increase in salary of 15 per cent to all members of the instructional corps was authorized by the board of trustees at its June meeting.

**Iowa College.**—Plans are being made to acquire a tract of 200 acres adjoining the present property, using an appropriation of $70,000 for an animal husbandry farm made two years ago.

Two new buildings are to be erected. One of these is a poultry house to be used for class laboratory work pending the erection of a permanent poultry husbandry building, and then as an incubator and brooder house. A concrete manure shed is to be built for the station. This will enable it to carry on more fertilizer experiments, especially with commercial fertilizers, the use of which is reported to be increasing in the State.

**Kansas College.**—A new course has been added known as agricultural relationships, and is required of agricultural students in the second semester of the senior year. This course deals with the relationships of the individual to agricultural enterprises and is designed to direct attention to the duties, opportunities, and responsibilities of agricultural college graduates as citizens of the agricultural community and as specialists in various phases of agricultural activities.

**New York State Station.**—Joseph W. Wellington, assistant horticulturist, has accepted a position with the U. S. Department of Agriculture in connection with its potato work. George H. Howe, assistant horticulturist, has been promoted to associate horticulturist. Recent appointments of assistants include Rossiter D. Olmstead and Clarence R. Phipps in entomology, Theodore E. Gatey in horticulture, Harold L. Weinstein in chemistry, and George J. Hucker in bacteriology.

**South Dakota College.**—The agricultural hall and administration building, containing a museum and auditorium seating 1,200 persons, 20 class and lecture rooms, and 19 laboratories, is ready for occupancy at a cost of $210,000.

**Vermont University.**—The honorary degree of doctor of literature was conferred on Dr. L. H. Bailey at the recent Commencement.

**Washington Station.**—J. L. St. John has been appointed assistant chemist, beginning September 15.

**West Virginia University.**—E. A. Livesay, assistant county agent leader in Missouri, has been appointed professor of animal husbandry, beginning September 1.

**Prospective Scientific Meetings.**—The thirty-third annual convention of the Association of American Agricultural Colleges and Experiment Stations will be held at Chicago, Ill., November 12 to 14.

The Association of Official Agricultural Chemists will hold its thirty-sixth annual convention at the New Willard Hotel, Washington, D. C., November 17 to 19.

# EXPERIMENT STATION RECORD.

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At this time, when the experiment stations are feeling keenly the pressure of unusual conditions, the necessity for rigid economy is impressed upon every administrative officer. The question is not now primarily one of growth and development, but of how to carry forward the work of the station on its present basis, and how to get done the things that need to be done and which the station has set itself to do. It has become a very real problem with most of the stations, often involving adjustment and even retrenchment.

The exercise of economy in the conduct of such an enterprise calls for clear thinking and discrimination. There is a false as well as a true economy, and the decision between the two requires a clear interpretation of the function of an experiment station and sound judgment in the policy of management. Economy does not relate primarily to the withholding of expenditure, although this is often compelled by present necessity, but it applies quite as much to the method and purpose which underlie the station work, and especially to the best utilization of research ability in the presence of a depleted supply. In its broad aspects judicious economy is the attempt to make the utmost of all the available resources of the station, human, physical, and financial, and direct these into the most effective channels.

With practically no increase in regular appropriations in the past five years, reaching back to the time of prewar prices and conditions, it goes without saying that every possible leak needs to be guarded; and this relates not only to expenditures but to lost motion and efforts which are unproductive from the standpoint of the station. Economy at such a time will dictate that the funds of the station and the facilities at its disposal be devoted to activities properly within its scope and which promise the most profitable returns. This means a discriminating judgment guided by a policy and a plan well within the scope and function of the station, designed to fit the exigency without a lowering of quality or standards.

The determination of such a policy and adaptation to present conditions requires rigorous self-examination. There are some drains upon the stations which may be corrected, and there are some hin-

drances and obstacles which it ought to be possible to remove. There are also some economies which might be effected by a redirection of certain features that have grown up in times of less stringency or persisted from the early days.

Since sound economy is a matter of good administrative judgment, adequate provision for administration is one of the prime essentials. During the period of the war there were unusual calls upon administrative officers, and to some extent their attention was diverted from the affairs of the station. In not a few cases the stations have begun to show the effects of this, and with the shortage of funds and of persons suited to do their work larger attention to their administrative details will be necessary to prevent their drifting or going backward.

The station work is not of less special character or less entitled to administrative oversight than the extension work; and research as the most advanced and intensive phase of agricultural education needs a type of administrative supervision which, with a keen understanding of its function and methods, will studiously organize and stimulate its activities so as to best utilize the resources at its command. Such an administration is fundamental to the proper recognition of values and to adjustment to the straitened circumstances.

In a general way the function of the experiment station has become clearer and more sharply differentiated year by year. There are certain features, however, which have been adhered to and which at the present time may afford a means of more definitely conserving funds and effort.

We no longer think of the management of large farms with incidental experimental features as being properly within the scope of the experiment station. There has been much improvement in this respect since the time when the college farm was turned over to the station to operate, and experimental work is now generally conducted on a more restricted and intensive scale. There are still numerous cases, however, where the station as such is responsible for the management of the entire farm, or of special features such as the poultry department, dairy, orchard, greenhouses, etc., and supplies the facilities for instruction as well as for experimentation. If in such cases the college contributes to their support there is no clear division and the responsibility rests with the station organization. Funds appropriated by the State for station purposes are employed in the support of these features, and men of the station staff give considerable of their time to their management. These workers are frequently judged in no small measure by the success of their management of these joint features in which the commercial element is prominent, and naturally they soon realize it and are guided by it. It tends to make the station work a secondary consideration.

There has been a tendency also to enlarge the station plant in various directions, to acquire considerable areas for the station in order to secure tracts suited to extensive field experiments and plantations, the remainder being carried by the station in general crops; and donations of farms or lands to the college have been turned over to the station to administer and to develop for such use as might be made of them in experimentation. The responsibilities and overhead expense are thus added to the station, and may result in a considerable diversion of funds and attention. Conditions may even prevent for the time being much real station work being done in connection with them. Indeed, there are instances in which persons on the station staff are doing no real experimental work, but are managing and developing tracts or herds or other features which may ultimately be used in part for experimental purposes. The staff is therefore enlarged by this amount without corresponding return, and the station budget is enlarged to carry on these non-experimental features. The station seems to have more staff and more funds than are available for its real work.

It is easy to underestimate the effect of such added responsibilities and the influence they may have on the station. It will be charged by the public with these funds as well as with the success of the enterprise, and it may not always be clear that it is making adequate return in actual experimental work. A large enterprise conducted in the name of the station without a substantial amount of experimental work is likely not to make a very favorable impression or to strengthen the station in appeals for funds.

The extent to which these large operations are engaged in is indicated in a way by the sales of station farm products. These now amount to considerably over a million dollars a year. They are thus no longer incidental features but one of the main elements in the total revenues of the stations. To a large extent, however, they represent a turnover rather than an addition to revenue, sometimes a net financial loss. Even where they seem to be commercially profitable a false impression is created if they exceed the actual needs of the station for experimentation.

There is opportunity for economy of both effort and funds in a revision of the project list so as to direct the work to live topics and confine the expense to substantial undertakings involving real inquiry. Agricultural investigation is an effort to determine and relate phenomena in such a way as to make the art intelligible and practice more effective. Experiments which only half answer a question do not meet the needs. Superficial work which must be gone over again multiplies the effort.

Much has been said about duplication in station work, a type of repetition which is not regarded as wholly profitable because it is a going-over of similar ground in a similar way, without adding anything new that is material in a broad sense, or contributing to the final solution. In some cases it may be largely a redemonstration. It is not constructive in the best sense, because it does not recognize what has been done and build upon it. It is opposed to careful analysis of the questions and originality in attacking them. There is still considerable of such work in the aggregate, and it accounts for quite an item of expenditure.

Satisfaction with the mere practical result applying to the immediate present, without attempt to analyze or weigh the factors which go to comprise it or may modify it, represents an attitude which is inadequate at the present time. The same attitude of inquiry needs to be encouraged in the simpler forms of experiment as in more fundamental investigation, although it may not lead as far. This attitude of inquiry, of searching for reasons as well as for facts, of guarding against inaccuracy, and of critical attention to the provision of conditions for sound conclusions, leads to a larger element of permanency in results and hence a more adequate return on the investment. It is important that the method and the procedure are adequate to the problem, and to insure this requires critical examination at the outset or at definite stages. Field and feeding experiments not infrequently exhibit evidences of haste and insufficient consideration in planting. The adequacy of the plan to give a clear and definite answer has not been critically scrutinized in advance. Too many things have been assumed, with the result that there are too many variables which rise up later to cause confusion and uncertainty.

Several stations have recently undertaken a critical examination of their projects to determine their importance and adequacy, and to ascertain where they are leading. It is an attempt to strengthen the program of investigation and experiment and at the same time to adapt ends to means. It provides for a certain measure of realignment with concentration upon the more important and promising lines, allowing the retrenchment to apply to the less significant ones.

The human element is recognized as the largest controlling factor in agricultural research, far overshadowing all others, and yet in practice it seems not always to be given the weight it is entitled to. The staff is usually provided with physical equipment without stint, but in a multiplicity of duties and calls its energies are dissipated to an extent which is serious for the station work, and it is itself sometimes made the subject of economy. Economy which begins with the staff begins at the wrong end, and is dwarfing to the institution.

The soundest economy requires a frank acknowledgment of the high requirements and the high standards which ought to prevail in agricultural research, and of the attractions necessary to draw into and hold in it persons of marked ability and training. The efficiency of a station is the sum of the efficiency of its staff, and one or two inadequate members may materially lower the average.

There are indications in some cases that the quality of agricultural investigation is being lowered by the employment of persons not properly adapted or prepared for it, and by the advancement to positions near the top of those inadequately trained or experienced. The effects of such a course may not be wholly immediate or temporary but may extend over a period of years. They are likely to do so unless the mistake is corrected. Unfortunately in some instances, due to scarcity no doubt, the standards formerly striven for are not being fully maintained, and these standards are not advancing with the development of the problems.

The stations need strong, well-equipped men now more than ever. Competition in securing and holding them has never been so keen as at present, and it now includes in larger extent than formerly various commercial and industrial concerns, which having become convinced of the need for scientific men seek the best. It is rarely that the stations can meet the offers from these agencies in terms of salary, but in some cases real economy will make larger attempt than has been made and will hold out attractions which have much weight with the man of research tendencies. And as between institutions of similar grade, the disadvantage of change and the present scale of salaries needs to be fully recognized. The flat salary scale of some institutions in which the station is included, with the difficulty in securing advance out of order or in proportion to real merit, is a decided handicap. The fact that research calls for a preparation and special ability beyond that of most other branches of activity is not yet recognized in all institutions or reflected in the salary roll. Ability to assess the value of men in the work of a station is one of the attributes of a successful director. He realizes that it is better to dig deep than to spread thin, more real economy to retain an investigator of demonstrated ability at a somewhat unusual salary than to risk a change with the present scarcity and with the inevitable lost motion which will result.

The shifting of men from one station to another is an element of weakness in our research at present. It is an uneconomical procedure resulting in loss to the progress of investigation through interruption and often abandonment of lines under way. One such move frequently results in a chain of changes affecting a considerable group of institutions.

In a specific instance, the calling of a head of department at one institution to a new position in another created a vacancy which was filled by drawing a worker from still another State, who had hitherto been wholly engaged in the station upon a fundamental inquiry for which special facilities had been developed. The project was in its eighth season, just beginning to give results, and probably represented an investment to the station in salary and material of approximately twenty-five thousand dollars. Being largely a field enterprise dealing with growing trees, it could not be moved and hence another expert must be looked for to continue it. Even with excellent records left behind, the human factor in such an investigation, the interest attaching to a personal effort, and the interpretation of the results so as to realize their full meaning count for very much.

There seems no sure remedy for this under present circumstances and no feasible means of avoiding the chain of lost motion which is usually set up. It is a result of the present competition and system of recruiting men. A certain amount of change, especially among the younger men, is to be expected and is desirable. It provides a stimulus and a means of growth. But greater consideration for the work would avoid some of the changes most serious in their effect, even at the expense of a departure from established procedure. A firm determination to withstand the taking away of key men would tend somewhat to discourage it.

The decreased efficiency through interruption and the doing of a variety of things is another source of economic loss. It is quite as important that the energies of the station workers should be economized and directed to productive channels as it is that the funds be spent in an economical and judicious way. It affords quite as large opportunity, although there may be even more difficulties involved in it. It may be far more fundamental in determining the product of a station.

Station workers are rarely in complete control of their time. They have other duties than their investigations—regulatory, teaching, correspondence, advisory, etc. These other duties serve as interruptions and as such may involve more than the actual time concerned. Many men need to be protected against themselves as well as against demands from without, to be stimulated to concentrate and to persist in their efforts, and to put the best that is in them into their work. The personal equation figures largely in this connection and hence requires sympathetic attention on the part of the director. Notable progress has been made in the proper division of time and effort where other duties are involved, and in grouping together the teaching periods or restricting this function to a particular season. Where this has not been accomplished it offers considerable opportunity for the economy of time and the proper direction of effort. Larger freedom for uninterrupted time in the station is still much to be desired.

Economy of the supply of workers, and especially those of outstanding ability in research, suggests utilization of their talents to the utmost. Research is not alone for the few if proper guidance can be supplied. Leadership is of great importance to make most highly effective the work of the rank and file. The history of science shows to how large an extent discoveries and important deductions have rested upon long series of accurate observations requiring care and patience, but not necessarily great genius. "The method of science is not a mysterious gift of genius but a practical tool in the discovery of facts and their application to the problems of everyday life." Much credit, therefore, belongs to the patient workers whose efforts help to make discovery possible provided their work is so done that it can be knit together.

In the drift toward specialization, scientific men have more and more segregated themselves into groups each of which confines itself to the study of a special and often narrow field. Specialization represents a great advance. It recognizes the deeper insight, the necessity of intensive study, and a differentiation of field and of skill. But specialization is opposed to generalization and may unfit men for it.

While specialization has served to advance scientific knowledge there is a danger in its isolation of retarding the solution of complex problems like those in agriculture. These problems have often been worked upon from the standpoint of the individual specialist, without particular reference to what investigators in another branch are doing. From the standpoint of the individual a special phase and not the broad problem may become the unit. It does not necessarily require a specialist to see a problem, and he may not see it in its entirety. The analysis of a question is an important step toward its study, and such analysis often needs the combined insight of specialists in different fields. Hence the advantage of organization of research around problems in such a way as to unite this viewpoint and means of attack.

Without administrative attention to the matter, however, correlation and joining of effort in accordance with a broad plan is usually not a prominent feature, and the necessary steps for rounding out the information and enabling the final solution must wait upon the different groups to voluntarily supply their parts. This tends to make results fragmentary and incomplete as relates to broad general questions, and may also lead to faulty conclusions because the factors are not all taken into account. The determination of how one set of facts and phenomena are related to another, the grouping of observations and experiments so as to derive from them broad general facts or principles, is a more delicate task than the development of isolated

facts. It is like one division of agricultural science attempting to develop an agricultural program for the country in war time. A combination of experts is more likely to view the matter with proper perspective and arrive at trustworthy conclusions. This promises more for the speedy solution of complex questions than the attempt to carry the methods of one science over into another, or the adoption of the findings of other branches of science while working in seclusion.

The combined action of investigators at different institutions who are engaged on common topics also offers opportunity for profitable joint effort. Competition and rivalry are less pronounced than formerly, and there is more disposition to meet upon a common ground if given encouragement. There is less reserve among those engaged in the more advanced lines of research in disclosing what they are doing, and regret if often expressed for the limited time at their disposal and the lack of help in following out suggestions which come to them.

But the largest opportunity for cooperation is perhaps in the less exacting and intensive class of experimental work, much of it local in character and dealing with conditions as they exist. This comprises a vast amount of the station work. A simple form is illustrated by variety testing, done quite independently by different stations and with little attempt to determine the range of varieties or the factors which modify their local adaptation. There is a lack of attempt to fix certain basic facts relating to classes of varieties which will relieve each State from going over much the same ground sooner or later, and often repeating this in different localities within its borders. It should not be difficult to determine the factors which underlie the success of a variety, and this would be made easier if a range of environmental conditions were involved in the plan, as in the case of a cooperative undertaking.

Field work is one of the most expensive types of experimental work and accounts for the necessity for large tracts and overhead in maintenance. It is being carried on by stations in the same region to test similar or like points, and involves a great amount of repetition and duplication of expense. But its results are largely local in character and contain relatively little that is basic because unrelated; and it usually does not go deep enough into the conditions represented to disclose the reasons for the results and the factors which modify them locally. A proper organization of such activity would offer opportunity for real economy and for more rapid advancement.

The need for more adequate funds for agricultural research is very generally recognized and relief is confidently expected sooner

or later. In the meantime the situation may be remedied somewhat by judicious management and a scrupulous conserving of all the stations' resources.

Economy in its sanest form will take the course of greater concentration, a focusing of the stations' revenues and energies on its specific work, a narrowing of its field to that of actual experiment and inquiry. It will not mean a lowering of standards or a weakening of forces, though it may mean a reduction in numbers. It will not mean dividing time with other branches in order to maintain a larger staff. Dilution and dissipation are opposed to strength.

Economy at the present time means retention of the key workers as far as possible, and the devotion of station forces more fully to disclosing and proving the facts of both science and practice, in an even more thorough and final way. This will mean a strengthening of the force that is employed and protection from scattering their energies in ways that do not make for actual progress.

If the situation is met in this manner it may prove a profitable experience, and better prepare for larger resources.

# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**Colloid chemistry**, J. ALEXANDER (*New York: D. Van Nostrand Co., 1919, pp. V+90, pls. 3, fig. 1*).—Brief chapters on the most important general properties of colloids are followed by a discussion of the practical applications of colloid chemical principles in many different fields. Among the topics included are agriculture, soap, milk, ice cream, confectionery, brewing, tanning, rubber, chemical analysis, pharmacy, foods and their preparation, and physiology and pathology.

**Catalytic hydrogenation and reduction**, E. B. MAXTED (*London: J. & A. Churchill, 1919, pp. VIII+104, figs. 12*).—The subject matter in this volume is presented under the following heads: Introductory, the preparation of catalysts, the methods of catalytic hydrogenation, the hydrogenation of unsaturated chains, the hydrogenation of unsaturated rings, miscellaneous reductions, dehydrogenation, and the technical hydrogenation of unsaturated oils.

**Changes in oils upon storage**, H. A. GARDNER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 759–761*).—Tables are given showing the analytical constants of commercial samples of vegetable and fish oils after different periods of storage of from two to eight years in indirect light and at ordinary room temperature.

The aging of nearly every oil caused a drop in the iodin number and a rise in the specific gravity, saponification number, and acid number. Changes in acid number were particularly marked in fish oils. Samples of American tung oil showed only moderate changes in the acid number but decided changes in the saponification number. Only slight changes took place in samples of corn, cottonseed, lumbang, sunflower, and hempseed oils which were perfectly clear and free from moisture at the time of storage. Sterilized oils were found to undergo less change than unsterilized samples. Oil stored in tin was found to undergo more change in storage than corresponding oil stored in glass.

The author concludes that "the changes that take place in oil upon standing are due very largely to autohydrolysis caused by the presence of either moisture or, in some instances, fat-splitting enzyms. Whenever oil is heated to a temperature of 105° C. for a sufficient period of time to remove the moisture, and then filtered, a moisture-free, clear, and sterile oil will result. Such oil will apparently keep for a long period of time without showing any marked changes."

**The rotatory powers of the amids of active α-hydroxy acids**, C. S. HUDSON (*Jour. Amer. Chem. Soc., 40 (1918), No. 5, pp. 813–817*).

**The rotatory powers of the amids of several α-hydroxy acids of the sugar group**, C. S. HUDSON and S. KOMATSU (*Jour. Amer. Chem. Soc., 41 (1919), No. 7, pp. 1141–1147*).

**The amid of α-δ-mannoheptonic acid**, C S. HUDSON and K. P. MONROE (*Jour. Amer. Chem. Soc., 41 (1919), No. 7, pp. 1140, 1141*).

**The constitution of capsaicin, the pungent principle of Capsicum**, E. K. NELSON (*Jour. Amer. Chem. Soc., 41 (1919), No. 7, pp. 1115–1121*).

[**Urease**], M. JACOBY (*Biochem. Ztschr., 74 (1916), No. 1–2, pp. 93–122; abs. in Chem. Abs., 10 (1916), No. 13, pp. 1754, 1755*).—This is a series of articles deal-

ing with urease as follows: Adsorption of Urease and Its Activity (pp. 93–96); Enzym Immunity (pp. 97–104); The Auxoaction of Amino Acids upon Urease (pp. 105, 106); The Action of Antiseptic Substances upon Urease (pp. 107, 108); Urea Decomposition by Bacteria (pp. 109–115); Action of Serum upon the Bacterial Urea Decomposition; and The Problem of Increase of Virulence of Bacteria in the Animal Body (pp. 116–122).

**The substitution of methyl alcohol and denatured alcohol for ethyl alcohol,** J. PRESCHER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 11–12, pp. 286, 287*).

I. *Attempts to substitute methyl for ethyl alcohol in the Gottlieb-Roese method for determining fat* (pp. 286, 287).—Methyl alcohol proved unreliable in the Gottlieb-Roese test on account of the lack of a clear line of separation between the ether and water layers of the mixture.

II. *The use of denatured alcohol in judging the freshness of milk* (p. 287).—Alcohol denatured by the addition of pyridine bases is considered reliable for this test on account of the very small amount of bases required for denaturation. Alcohol denatured by acid is, however, considered unsuitable unless it is distilled over potassium hydroxid and the first part of the distillate discarded.

**A simple weighing burette,** D. W. MACARDLE (*Jour. Indus. and Engin. Chem., 11 (1919), No. 7, p. 670, fig. 1*).—The burette consists of an ordinary 100 cc. Erlenmeyer flask fitted with a two-hole stopper. In one of the openings is placed a glass stopcock taken from a broken burette and in the other a bent glass tube drawn at the outer end to a capillary. Both stopcock and tube end just below the cork and above the level of the standard solution in the flask. To use the burette the cock is closed, the flask turned so that the capillary is over the titrating vessel, and the solution forced into the capillary by the warmth of the hand. On opening the cock the liquid will then flow freely. When near the end-point the cock may be closed and the solution forced out in drops by the heat of the hand.

The accuracy of the burette is said to be limited only by the sensitiveness of the end-point.

**A laboratory drying apparatus,** S. FRÄNKEL (*Biochem. Ztschr., 74 (1916), No. 3–4, pp. 170–175, figs. 3*).—The apparatus, which is constructed on the principles of the commercial apparatus, consists of a kettle heated with gas, a condenser, and a drying cupboard which can be heated with hot water or steam through a series of pipes supporting the drying tray. The vacuum is obtained by means of an electric pump.

**A new condenser,** S. FRÄNKEL (*Biochem. Ztschr., 74 (1916), No. 3–4, pp. 165, 166, fig. 1*).—The condenser described is a modified Liebig type having seven small inner tubes in place of the single one of the usual condenser.

**A new form of distilling bulb,** J. S. MCHARGUE (*Jour. Indus. and Engin. Chem., 11 (1919), No. 7, pp. 670, 671, figs. 2*).—The principal feature of the new form of distilling bulb devised by the author at the Kentucky Experiment Station is that the part within the bulb of the tube connected with the distilling flask is T-shaped. The arms of the T tend to diminish the possibility of any of the alkaline contents of the distilling flask being forced into the condensing tube. Steam flowing out of the two arms keeps the bulb at a more uniform temperature and hastens distillation. The arms of the T slope downward, and the openings at the end are large enough to prevent water from being held in them by back pressure. Two small holes blown in the stem of the T within the bulb allow condensed water to return to the flask as soon as formed.

The bulb is illustrated by a diagram.

**An instrument for the determination of small quantities of carbon monoxid in hydrogen**, E. K. RIDEAL and H. S. TAYLOR (*Analyst, 44 (1919), No. 516, pp. 89–94, figs. 2*).—An instrument is described and illustrated which has been adapted for the continuous analysis of hydrogen supplies and for automatic registration of the carbon monoxid content. The principle employed is that of preferential catalytic combustion of the carbon monoxid with a small amount of added oxygen, the carbon dioxid formed being suitably absorbed and estimated. The preferential combustion of the carbon monoxid was found to occur in the presence of metallic oxids and to be increased by using a mixture of several oxids. A mixture of iron and chromium oxids with small quantities of cerium and thorium oxids proved very satisfactory.

By means of this instrument it has been found possible to determine and record very quickly minute traces of carbon monoxid in hydrogen and also to differentiate rapidly between various catalytic agents.

**Analytical method for determining efficiency of ammonia oxidation**, D. P. GAILLARD (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 745–747, fig. 1*).—The efficiency of ammonia oxidation is determined by a comparison of the percentages by weight of combined nitrogen in the entrance and exit gases of the converter. In the "bulb" method of analysis here described a sample of the gases to be analyzed is drawn into a previously weighed evacuated bulb, and a second weighing is made to obtain the weight of the sample. In the case of the entrance gases, the combined nitrogen in the form of ammonia is determined by absorption in water and subsequent titration with N/10 sulphuric acid. In the case of the exit sample, after the introduction of water, oxygen is drawn in and the bulb shaken for several minutes, after which the liquid and washings are transferred to a beaker and titrated with N/10 sodium hydroxid.

The detailed procedure is described in full and suggestions are given for variations in procedure. The average precision of a single efficiency determination in duplicate is thought to be within ± 0.75 per cent. The chief merit of the method is its simplicity, both in the analytical work and in the calculations.

**Adaptation of the Mohr volumetric method to general determinations of chlorin**, L. YODER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, p. 755*).—The author at the Iowa Experiment Station has developed a modification of the Mohr method of determining chlorids which has proved applicable to rapid determinations of chlorin in various materials, particularly in organic products containing small amounts of the element. The procedure adopted is as follows:

"To the sample is added 5 cc. of a 30 per cent solution of calcium acetate with sufficient distilled water to thoroughly saturate the material. The mixture is evaporated to dryness at 120° C. and ignited at a temperature not over 450°. The cooled residue is thoroughly moistened with a few cubic centimeters of a 10 per cent solution of ferric acetate, and again evaporated to dryness and ignited below 450°. The residue is triturated with hot water, filtered, and washed until free from chlorids. The filtrate is evaporated to dryness or nearly to dryness and taken up with just sufficient hot water to insure complete solution of the chlorids when cooled. After the addition of 2 or 3 drops of potassium chromate, the solution is titrated with 0.05 N silver nitrate."

Tables are given of the results obtained in the determination of chlorin by this method and by the gravimetric method in different samples of cow feces, mixed grains, and alfalfa hay. The results were in all cases well within the limits of experimental error.

**The choice of indicators for the acidimetric determination of boric acid,** J. PRESCHER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 11–12, pp. 283–286*).—Sources of error in the use of various indicators in the acidimetric determination of boric acid are discussed, and phenolphthalein is recommended as giving the most accurate results.

**The alkalimetric determination of small amounts of magnesium,** P. L. HUBBARD (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 753, 754*).—Certain modifications in the Bruckmiller process for determining magnesium by titration of ammonium magnesium phosphate (E. S. R., 37, p. 412) have been introduced by the author in an application of the method to the determination of magnesium in soil extracts. The principal changes consist in the use of the Gooch crucible for filtration, of neutralized alcohol followed by a water solution of ammonium magnesium phosphate for washing, and of methyl red instead of methyl orange as an indicator. The method as modified is said to be exact for the estimation of quantities of magnesium of 5 mg. or less down to 0.1 mg.

**Standards of purity for food products** (*U. S. Dept. Agr., Off. Sec. Circ. 136 (1919), pp. 22*).—This circular contains the definitions and standards for food products published in the form of Food Inspection Decisions since Circular 19 (E. S. R., 18, p. 459), which it supersedes, and those originally published in that circular which have not been superseded by such decisions.

**Analyses of flours for the determination of the percentage extraction,** O. PRANDI and F. PERRACINI (*Staz. Sper. Agr. Ital., 50 (1917), No. 6–8, pp. 391–393; abs. in Chem. Abs., 13 (1919), No. 12, p. 1349*).—To determine the percentage of extraction of a flour the authors state that, in addition to the microscopic and organoleptic examination, the test should include determinations of nitrogen, ether extract, cellulose, and ash. The formation of furfural from flour by heating with hydrochloric acid and its subsequent determination as phloroglucid are recommended as furnishing additional evidence in doubtful cases. The results obtained by the authors with this determination, using the Tollens-Krüger method on 400 cc. of the distillate and calculating to the dry basis, are as follows: Flour of 80 per cent extraction, minimum 3.1 per cent, maximum 3.31, average 3.25; 85 per cent extraction, minimum 3.81, maximum 4.61, average 4.09; and 90 per cent extraction, minimum 6.7, maximum 7.18, average 6.95 per cent.

**The milling grade of rye flour,** J. GERUM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 31 (1916), No. 6, pp. 176–180*).—The author considers the determination of total nonstarches to be the best method for judging the milling grade of rye flour. Starches are determined by the method of Lehmann and Schowalter (E. S. R., 28, p. 807), 30 minutes heating with alcoholic potassium hydroxid being sufficient. The nonstarches are estimated by difference. The results are reported of the application of this method to the examination of several samples of rye flour.

**The marc content of sugar beets and its determination,** H. CLAASSEN (*Ztschr. Ver. Deut. Zuckerindus., 1916, No. 723, II, pp. 359–370; abs. in Chem. Abs., 11 (1917), No. 9, p. 1330*).—A method of determining the marc content of sugar beets which is said to give very concordant results is described as follows:

Twenty-five gm. of the shredded beet pulp is placed in a beaker having a mark at 400 cc. The beaker is filled to the mark with boiling water and the mixture digested for 2 minutes. The solution is poured off as completely as possible and the process repeated three times. The marc is then transferred to a weighed filter or Gooch crucible, washed with a little alcohol, dried for from 6 to 8 hours at 105 to 110° C., and weighed. To determine the solubility of the

mare on long-continued extraction, the dried and weighed residue should be subjected to further extraction with six different portions of boiling water.

**The critical temperature of solution applied to the analysis of fats.** F. Olivari (*Staz. Sper. Agr. Ital., 50 (1917), No. 6–8, pp. 365–381, figs. 2; abs. in Chem. Abs., 13 (1919), No. 12, pp. 1347, 1348, figs. 2*).—The author states that the concentration of the fat in any solution may be considered as if the fat were a single substance and the system studied as if it consisted of two components, fat and solvent. The conditions of equilibrium in two simple cases, an anilin-tallow system and an acetic acid-tallow system, are illustrated by curves from which the percentage of tallow in the mixture can be determined. The measurements involved can be carried out by fixing either the temperature or the concentration of the fat. The last method has had a partial application in the measurement of the solubility of oil.

**Tentative standard methods for the sampling and analysis of commercial soaps and soap products.** A. Campbell (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 785–788*).—These tentative methods are presented by the committee of the American Chemical Society on the methods of analysis and specifications of commercial soaps and soap products. For some determinations alternative methods are reported for suggestions and criticism preparatory to adopting standard methods.

**Some notes on paint analysis.** G. J. Hough (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 767, 768*).—Methods devised by the author at the Bureau of Soils, U. S. Department of Agriculture, to meet particular cases in testing paint supplies are outlined. These include the determination of cuprous copper in copper paints, a rapid method for lime in white lead, the detection of chromium in mixed pigments, and an improved method for chromium in chrome yellow. A convenient method for the preparation of a starch indicator which will keep indefinitely is also described, in which a dilute solution of salicylic acid is employed as a solvent.

**Acid test on enamel ware.** W. D. Collins (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 757–759*).—Acid tests were made at the Bureau of Chemistry, U. S. Department of Agriculture, on 51 samples of white, gray, and blue enamel ware from 26 different American manufacturers.

The test most used was made by boiling 500 cc. of 4 per cent acetic acid in the vessel for 30 minutes. About half of the samples of white and gray ware suffered no loss of glaze on such treatment, while nearly all the blue ware was badly affected by 2 per cent acid. From 34 of the samples antimony was dissolved in amounts of from 0.5 to 2 mg. Lead was found in ware from only one manufacturer.

**The desaccharification of beet molasses with lime by extraction of the sugar juice.** Daude (*Ztschr. Ver. Deut. Zuckerindus., 1916, No. 723, II, pp. 379–397, figs. 6; abs. in Chem. Abs., 11 (1917), No. 9, p. 1330*).—A review of patent literature.

**Date pasteurizing and ripening apparatus.** A. E. Vinson and C. N. Catlin (*Arizona Sta. Rpt. 1917, pp. 479, 480*).—For several years the entire output of the Tempe Date Orchard has been pasteurized with a small pasteurizer heated by a gasoline brooder heater. A new pasteurizer of wood, recently constructed, is described in detail, together with an improved carbon dioxid ripener of greater capacity than formerly used.

**Reaction products of alkali-sawdust fusion; acetic, formic, and oxalic acids and methyl alcohol.** S. A. Mahood and D. E. Cable (*Jour. Indus. and Engin. Chem., 11 (1919), No. 7, pp. 651–655*).—An investigation is reported from the Forest Products Laboratory, U. S. Department of Agriculture, of the amount

of acetic, oxalic, and formic acids and methyl alcohol obtainable from the sawdust of various species of wood by fusion with alkali. The data obtained are summarized as follows:

"From 17 to 20 per cent of acetic acid can be obtained from hardwood sawdust by fusion with sodium hydroxid. A simultaneous production of oxalic acid amounting to approximately 50 per cent of the dry weight of the wood is obtained. If the reaction is carried out in a closed vessel, a simultaneous production of methyl alcohol results amounting to 2.4 per cent; but as the temperature is increased beyond 200° the yield of oxalic acid is considerably reduced. At lower temperatures both formic and acetic acids are produced, amounting to approximately 15 per cent each. It has been found possible to recover as much as 91 per cent of the alkali used."

## METEOROLOGY.

**The importance of climatology to tropical agriculture**, F. T. McLean (*Philippine Agr., 7 (1919), No. 7, pp. 191–194*).—The subject is discussed particularly from the standpoint of conditions prevailing in the Philippine Islands. It is stated that "the great variety of climatic conditions to be found in the mountains and lowlands of the Philippines makes a study of climatology especially profitable for Philippine students of agriculture."

**Meteorological observations at the Massachusetts Agricultural Experiment Station**, J. E. Ostrander, A. L. Chandler, and G. A. Smith (*Massachusetts Sta. Met. Buls. 365–366 (1919), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1919, are presented. The data are briefly discussed in general notes on the weather of each month.

**Meteorology report for 1917**, F. E. Hepner (*Wyoming Sta. Rpt. 1918, pp. 90–94*).—Monthly summaries are given of observations at Laramie, Wyo., during 1917 on temperature, pressure, precipitation, humidity, sunshine, and wind movement. The highest temperature was 88° F., July 22; the lowest, —24°, January 22. The total precipitation was 9.71 in. The highest relative humidity was 100 per cent; the lowest, 16 per cent, June 23. The greatest velocity of wind was 740 miles per day, May 8. The first killing frost was September 15.

**Measurements of precipitation under trees**, F. Linke (*Met. Ztschr. [Brunswick], 33 (1916), No. 3, pp. 140, 141*).—It is stated that observations at the Taunus Observatory, near Frankfort, at an elevation of about 800 meters (2,624 ft.) above sea level and with a mean annual precipitation of about 1,000 mm. (39.4 in.), show 66 per cent more precipitation annually under trees than in the open. The excess occurred during dewy and foggy days. Without fog and dew the precipitation was less under trees than in the open.

**Fourth report of the Committee for the Investigation of Atmospheric Pollution, 1917–18** (*Lancet [London], 1919, I, No. 24, Sup., pp. XXIII, figs. 6; No. 24, p. 1035*).—In continuation of previous reports, data obtained at 24 stations in England and Scotland are summarized and discussed.

The data indicate some improvement in the state of the atmosphere during the winter months, but that pollution during the summer months is on the increase as compared with previous years. The deposit of sulphates was greatest during the winter months. The deposit of ammonia was practically the same in summer as in winter. "Sulphates, chlorin, and ammonia vary more or less together, and this is to be expected, as they all form part of the soluble deposit, which is to a great extent governed by the rainfall. None of the other deposits appear to show any special relation to each other."

## SOILS—FERTILIZERS.

**Are soils mapped under a given type name by the Bureau of Soils method closely similar to one another?** R. L. PENDLETON (*Univ. Cal. Pubs. Agr. Sci., 3 (1919), No. 12, pp. 369–498, pls. 32, figs. 37*).—This study conducted at the University of California is an attempt to see whether certain soil types, mapped as the same from different areas of California and judged to be the same by the criteria used by the Bureau of Soils of the U. S. Department of Agriculture, are the same or similar when examined from the laboratory standpoint. Twenty-four presumably typical samples of four soil types from widely distributed localities in the State were submitted to physical, chemical, and bacteriological analyses and to pot culture tests to determine their ability to produce different crops.

With reference to physical relations between the soils, it was found that the mechanical analysis by the Hilgard elutriator showed that the soils of a given type were in some cases quite divergent from each other in their content of certain of the sizes of particles. The mechanical analysis by the Bureau of Soils method showed that 6 of the 24 soils were not true to their type names, and that of those soils within the type there was considerable variation. The moisture equivalents for the several types showed distinct enough values to substantiate the field separation. The hygroscopic coefficients varied widely within each type, and the types were not shown to be distinctly different by this criterion.

With reference to chemical relations it was found that the total nitrogen averages varied markedly from type to type, with the Altamont clay loam containing three times that in the San Joaquin sandy loam. The average humus content of the San Joaquin samples was about half that of the other types. The variations in humus content between the types were small, considering the diverse nature of the types and the large range in the amount of humus within the type. The loss on ignition showed considerable variation within the type and no significant distinction between the four types. The average total calcium content of the types was distinct, though the wide range within each type minimized the significance of the variation in the averages. With regard to magnesium, the types were neither distinct nor were the soils within the type closely similar. The average phosphorus content of the types was distinct, though the ranges within the several types frequently overlapped. The total potassium results did not show the types to be distinct nor the soils within a type closely similar.

With reference to bacteriological relations, it was found that the ammonifying power showed rather larger variations from type to type than between the samples of a type. The nitrogen fixation data did not show characteristic differences for the several types.

"Regarding nitrification as a whole there may be a greater divergence between the samples of a type than between types. The relative nitrification of the soil's own nitrogen varies with the type, as does the relative nitrification of the several nitrogenous materials added."

Pot cultures in the greenhouse showed that "different representatives of a given type are not the same in their ability to produce crops. The arrangement of the samples of a given type according to their fertility may or may not vary with the special crops used as the indicators. The types are distinct with respect to their fertility, considering their average production. Therefore it is concluded that with regard to the 24 soils of four types examined, all soils mapped under a given name by the Bureau of Soils method may or may not be closely similar, depending upon the criteria used. The greater number of

the criteria show the soils of a type to be not closely similar, and the types to be but little differentiated from each other."

In addition, there are given an historical sketch of the development of soil classification and mapping and a discussion of certain of the methods employed by the Bureau of Soils. It is pointed out that despite its defects the work of the Bureau of Soils is of value, and is practically the only type of soil classification and mapping possible under the conditions imposed.

**Field operations of the Bureau of Soils, 1914 (sixteenth report)**, M. WHITNEY ET AL. (*U. S. Dept. Agr., Field Oper. Bur. Soils, 1914, pp. 2850, pls. 89, figs. 73, maps 67*).—Supplementing similar work previously noted (E. S. R., 36, p. 210), this comprises a general review of the field work conducted by the Bureau of Soils during 1914, together with detailed reports on 78 surveys which have already been noted from time to time.

During the year 37,618 square miles or 24,075,520 acres were surveyed and mapped in detail, making the total area surveyed and mapped up to January 1, 1915, 353,412 square miles or 226,183,680 acres. Reconnoissance surveys covering an area of 40,120 square miles or 25,676,800 acres were also made.

**Soil survey of Howard County, Ark.**, M. W. BECK, M. Y. LONGACRE, F. A. HAYES, and W. T. CARTER, JR. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 48, pls. 3, fig. 1, map 1*).—This survey deals with the soils of an area of 385,280 acres situated in the southwestern part of the State and lying in the southern part of the Appalachian Mountain and Plateau Province and in the northern part of the Gulf Coastal Plain Province. The topography of the northern section of the region is hilly to mountainous and of the southern part level to gently rolling. Natural drainage is generally well established.

The soils of the county include residual upland soils derived from sandstone and shale, sedimentary upland soils, terrace or old alluvial soils, and first-bottom or recent alluvial soils. In addition to rough stony land and chalk, 33 soil types of 21 series have been mapped. Hanceville stony fine sandy loam and Hanceville fine sandy loam, occuping 21.8 and 11.5 per cent of the total area, respectively, comprise the prevailing types.

**Analyses of soils of DeKalb County**, W. A. WORSHAM, JR., D. D. LONG, L. M. CARTER, M. W. LOWRY, and W. O. COLLINS (*Ga. State Col. Agr. Bul. 163 (1919), pp. 29, pl. 1, figs. 3*).—This bulletin reports and discusses chemical analyses of samples of each of the 11 soil types found in an area of 174,080 acres in north central Georgia.

The discussion of analyses indicates that the upland soils of the county are fairly well supplied with potash, with the exception of the Iredell types. The bottom soils and at least two of the upland types are considered to be abundantly supplied with potash. The nitrogen and phosphoric acid contents are low in all the upland types. Nitrogen and organic matter are considered to be the limiting fertility factors of the soils of the county, followed by phosphoric acid, and liming and deep tillage of the soils are considered advisable.

A considerable variation in the composition of the different soil types of the county is shown.

**Analyses of soils of Dougherty County**, W. A. WORSHAM, JR., D. D. LONG, L. M. CARTER, and M. W. LOWRY (*Ga. State Col. Agr. Bul. 126 (1917), pp. 47, pl. 1, figs. 4*).—This bulletin reports and discusses chemical analyses of samples of soil from each of the 24 soil types of an area of 219,520 acres in southwestern Georgia.

The analyses indicate that phosphoric acid is the limiting factor in the fertility of these soils, and that the nitrogen and potash contents are generally low. It is also concluded that these soils are in need of lime and deep tillage.

**Analyses of soils of Jackson County,** W. A. WORSHAM, JR., D. D. LONG, L. M. CARTER, M. W. LOWRY, and W. O. COLLINS (*Ga. State Col. Agr. Bul. 144 (1918), pp. 24, pl. 1, figs. 2*).—This bulletin reports and discusses analyses of soil samples from each of the 9 soil types from an area of 221,440 acres in northeastern Georgia.

The discussion of analyses indicates that nitrogen is the limiting fertility factor in these soils and that they are relatively deficient in phosphoric acid. They are well supplied with potash but are in need of lime and deep tillage.

**Analyses of soils of Polk County,** W. A. WORSHAM, JR., D. D. LONG, L. M. CARTER, M. W. LOWRY, and W. O. COLLINS (*Ga. State Col. Agr. Bul. 127 (1917), pp. 54, pl. 1, figs. 6*).—This bulletin deals with the chemical composition of both the soil and subsoil of the various soil types of an area of 200,320 acres in northwestern Georgia. Thirty-one soil types and three phases are discussed, of which the Clarkville gravelly loam covers 33 per cent, the Decatur clay loam 14 per cent, and the Talladega slate loam 10.1 per cent of the county.

It is concluded that nitrogen and phosphoric acid are the limiting factors in the fertility of Polk County soils. The potash content is relatively high. Practically all of the soils are acid and in need of lime.

**The soils of Anne Arundel County,** J. C. BRITTON and C. R. ZAPPONE, JR. (In *Md. Geol. Survey—Anne Arundel County. Baltimore: Johns Hopkins Press, 1917, pp. 133–174, pl. 1*).—This report deals with the soils of an area of about 275,840 acres lying wholly within the Coastal Plain region of Maryland.

In general there is a fairly definite relationship between the soils and topography. Eighteen soil types of five series are recognized, of which the Sassafras series cover about 55 per cent of the area. The Sassafras fine sandy loam, sand, and silt loam cover, respectively, 15.5, 14.6, and 11.2 per cent of the area. It is stated that the soils of the Sassafras series are the most productive of the area. Practically all the soils are said to be deficient in organic matter.

**Soil survey of Barbour and Upshur Counties,** W. J. LATIMER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 51, fig. 1, map 1*).—This survey deals with the soils of an area of 447,360 acres situated in the north central part of the State and lying within the greatly dissected portion of the Appalachian Plateau. The topography in general is steep and broken although modified somewhat over the northwestern part of the region. Elevations range from 1,000 to 3,250 ft. above sea level. Natural drainage is generally well established.

The upland soils of the area have been derived from the weathering in place of alternate strata of sandstone, gray and red shale, and thin beds of limestone of the Carboniferous era, while alluvial soils also occur along the streams. In addition to rough stony land, 15 soil types of 9 series are mapped. Dekalb stony loam and Dekalb silty clay loam, occupying 37.2 and 29.4 per cent of the total area, respectively, predominate.

**Arable lands** (*Rpt. Min. Agr. Prov. Quebec, 1917, pp. 90–100*).—Analyses of 14 samples of soils from the island of Orleans, Province of Quebec, are presented and discussed. Twelve of the soils were acid. The two soils not acid were black mucks containing a large proportion of organic matter and a good proportion of lime. All the soils were deficient in potash, which is apparently their chief defect. They were all relatively well provided with nitrogen.

Analyses of all samples of clay soils from Abitibi, Province of Quebec, are also reported. All of these except one showed pronounced acidity.

**Fertility survey of the Egyptian Delta,** B. F. E. KEELING (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 366–369*).—The results of a soil survey of the central and western Delta showed that the fertility survey is a close approx-

imation of the salt survey by eye estimation. The mean salt content of what is considered good land was about 0.3 per cent, of medium land 0.5 per cent, and of poor land about 0.8 per cent. Barren land contained any amount of salt up to 25 per cent. Considerable quantities of both sodium carbonate and bicarbonate were found in the soils of the more northerly part of the Delta. The close dependence of soil fertility upon altitude above sea level is also noted.

**Malayan rubber and coconut soils,** M. Barrowcliff (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 410–421*).—The Malayan rubber soils are classed as undulating land, flat land, and flat peaty coast land, the first and last being the most productive. Mechanical and chemical analyses of 10 representative samples of rubber soils showed the undulating soils to be of a light sandy nature with perfect natural drainage, the flat soils to be of close and impermeable texture, and the flat peaty soils light and porous owing to their content of organic matter.

The nitrogen and lime contents of these soils, while relatively low, seemed sufficient for the growing of rubber. No relation was established between potash content and fertility. With the exception of the peaty soils, the soils were markedly deficient in phosphates, this being apparently the limiting factor.

The coconut soils are mostly peaty soils containing much clay and organic matter. "They are well supplied with nitrogen and with potash and phosphate, both in the total and 'available' forms. Observations go to show that if badly drained they are infertile; but that for coconuts the drainage need be less deep and thorough than for rubber."

**The effect of organic matter on soil reaction,** R. E. Stephenson (*Soil Sci., 6 (1918), No. 6, pp. 413–439*).—Studies conducted at the Iowa Experiment Station on the effect of albumin, casein, blood, starch, dextrose, alfalfa, and ammonium sulphate on the reaction of a silt loam soil fairly rich in organic matter and a sandy loam soil low in organic matter are reported. The treatments with organic matter were made at the rate of 10 tons per acre. Alfalfa was applied to the silt loam soil at the rate of 20 tons per acre, and ammonium sulphate was applied in all cases at the rate of 1 ton per acre.

It was found that none of the organic treatments increased the lime requirement of the soils. The highly nitrogenous materials rather had the effect of decreasing the acidity. This effect was very marked at the first sampling. Ammonium sulphate, on the other hand, consistently caused a marked increase in the lime requirement of both soils. The carbohydrate materials had a small and inconsistent effect upon the soil reaction. The highly nitrogenous organic materials which diminshed the acidity tended to protect the carbonates of the soil at the first sampling. Later, the same materials used up the limestone quite completely in some cases and to a much greater extent in all cases than did the soil alone. Ammonium sulphate, likewise, very consistently exhausted the lime of the treated soils. The carbohydrates and the alfalfa had no more marked effects in exhausting the carbonates than in increasing the acidity.

Ammonification was greater in the absence of lime on both acid soils. A difference in the soil flora is considered a possible explanation. Both casein and albumin ammonified more rapidly than blood, which is of higher nitrogen content. Ammonia did not accumulate in the presence of either carbohydrates or alfalfa.

Nitrification occurred most rapidly in the presence of lime. Nitrification was slow in starting in the presence of the nitrogenous materials, except blood, probably due to a slight toxicity of accumulated ammonia and exhaustion of nitrates caused by the multiplied flora. No nitrates were found in the presence of the carbohydrates until the end, probably because they were consumed by the organ-

isms of the soil. Taking the sum of nitrates and ammonia, there was the greatest action in the presence of lime on the untreated soil, but the reverse was true in most cases for the treated pots.

The two soils showed as marked differences in their behavior as did the different treatments. The more acid soil was much more active, probably because of greater content of organic matter and a more abundant flora.

**The relation of the lime requirements of soils to their retention of ammonia**, L. P. HOWARD (*Soil Sci., 6 (1918), No. 6, pp. 405–411*).—Experiments conducted at the Rhode Island Experiment Station on the determination of the lime requirement of soils are reported in which soils were treated with ammonium hydroxid, the excess ammonia evaporated off at the temperature of boiling water, and the retained ammonia estimated.

Within reasonable limits the requirement based upon this retention was independent of (1) concentration of ammonia added, (2) time of contact, and (3) temperature during evaporation. The requirement was about 25 per cent lower than that indicated by the Veitch method. Aeration in the presence of sodium carbonate for 18 hours (300 liters of air per hour) was sufficient to remove completely from 50 to 75 mg. of ammonia from the soil. Sodium, ammonium, and potassium from solutions of their hydroxids and carbonates were retained in practically equivalent amounts. It is believed that the ammonia retained is held chemically by a neutralization of either free acids, acid organic compounds, or acid salts, while physical absorption is largely prevented. The lime requirement based upon the ammonia retention agreed in general with field observations, to the extent that soils needing the most lime showed the greatest lime requirement.

**Toxicity of "alkali" salts**, T. M. SINGH (*Soil Sci., 6 (1918), No. 6, pp. 463–477*).—Studies conducted at the Oregon Experiment Station are reported to determine (1) the toxic points of sodium chlorid, nitrate, carbonate, and sulphate on wheat and peas, (2) the toxic point of a combination of alkali salts in field soils on wheat and peas, and (3) the effect of sodium chlorid, nitrate, carbonate, and sulphate upon ammonification, nitrification, and nitrogen fixation. The soil used was a productive heavy silt loam.

It was found that in order of toxicity the salts ranked as follows: Sodium chlorid, nitrate, carbonate, and sulphate. The percentage of the anion and not the cation was the determining factor. Small amounts of each of the different salts used stimulated both crop growth and bacterial activities. This amount varied with the crop grown, and the concentrations at which stimulation took place bore the same relationship to each other as did their toxicity points.

Sodium chlorid became toxic to both ammonification and nitrogen fixation at a concentration of 0.01 per cent. The toxic point for wheat was 0.4 and for field peas 0.2 per cent.

Sodium nitrate became toxic to ammonification at a concentration of 0.01 per cent and to nitrogen fixation above 0.4 per cent. Small concentrations of sodium nitrate proved toxic to nitrification, but at a concentration of 0.4 per cent a marked stimulation took place. The toxic points for wheat and for peas were 0.8 and 0.6 per cent, respectively.

Sodium carbonate was toxic to ammonification at a concentration of 0.02 per cent, to nitrification at 0.8 per cent, and to nitrogen fixation at 0.01 per cent. For wheat the toxic point was 1 per cent and for peas 0.6 per cent.

Sodium sulphate proved to be the least toxic of all the salts. Neither ammonification nor nitrogen fixation was inhibited to any extent at concentrations up to 2 per cent and peas up to between 1 and 2 per cent.

The toxicity point as found when salts were used in combination, as under field conditions, checked very closely with the points found when the individual

salts were present. The toxic point of the combined salts depended upon the percentages of the chlorids, nitrates, carbonates, and sulphates present and the combination in which they existed. Calcium sulphate, when present, lowered the toxic point of the chlorid, carbonate and nitrate of sodium.

**Notes on recent work concerning acid soils,** L. T. Sharp and D. R. Hoagland (*Soil Sci., 7 (1919), No. 3, pp. 197–200*).—The authors refer to previous reports by Gillespie and Hurst (E. S. R., 38, p. 620) and Rice and Osugi (E. S. R., 40, p. 123) bearing on the subject, and since they disagree with the latter report a number of experiments were conducted at the California Experiment Station on the inverting power of soils and their extracts. The soil or soil extract was heated with a 10 per cent sugar solution at 85° C. for one hour and the amount of copper reduced determined.

It was found that soils of the highest hydrogen-ion concentration caused the greatest inversion, and the very slightly acid soils and alkaline soils gave only a slight inversion. A marked inversion was also produced by the extracts of the soils of high hydrogen-ion concentration. A larger inversion resulted when the sugar solution was heated in the presence of the solid soil particles.

It is concluded that "large inversion occurs only in soils of distinctly acid reaction, with the greatest inversion occurring coincidently with the highest H-ion concentration of the soil suspension as well as of the water and the sugar extracts."

Direct evidence was also obtained that acid soils do give acid filtrates, giving acid reactions generally of a magnitude very similar to those obtained with the suspensions. Boiling the extract for several minutes produced no large changes in hydrogen-ion concentration.

**Determination of the rate of solution of atmospheric nitrogen and oxygen by water,** W. E. Adeney and H. G. Becker (*Sci. Proc. Roy. Dublin Soc., n. ser., 15 (1918), pp. 385–404; abs. in Jour. Chem. Soc. [London], 116 (1919), No. 677, II, pp. 104, 105*).—Experiments are reported, the results of which confirm previous conclusions by the authors to the effect that the gases are absorbed by the surface layer of the water but do not remain concentrated there, diffusing gravitationally through the lower layers of the water with comparative rapidity.

**Can we predict probable fertility from soil biological data?** P. S. Burgess (*Soil Sci., 6 (1918), No. 6, pp. 449–462*).—Experiments at the Hawaiian Sugar Planters' Station are reported, the purpose of which was to determine the relation between microbiological data and the crop-producing powers of the soil. Tests of ammonification, nitrification, total organic nitrogen supplied rendered water soluble, and nitrogen fixation were conducted in 9 Hawaiian sugar-cane surface soils, using dried blood, fine alfalfa meal, and fish scrap. Three of the soils were exceptionally fertile, 3 were capable of producing good average crops, while 3 produced poor crops of cane after fair fertilizer applications.

It is concluded that "ammonification tests are not suitable to differentiate between the fertilities of average Hawaiian soils, although they will often show differences between very poor and very good soils. The abilities of soils to render organic nitrogen (of blood or alfalfa) water-soluble are of no value as measures of their crop-producing powers." Nitrification is considered by far the most accurate biological soil test for predicting the probable fertility of Hawaiian soils. There was a remarkable correlation between the amounts of nitrogen fixed in mannite solution cultures and the known fertilities of the soils studied. There was little difference in the comparative rating of the soils, depending upon whether nitrification or nitrogen fixation tests were used as the criteria of fertility.

**Some notes on the cause of the unproductivity of "raw" subsoils in humid regions**, P. R. McMiller (*Soil Sci., 7 (1919), No. 3, pp. 233–236*).—Vegetation experiments conducted at the Minnesota Experiment Station with certain Minnesota prairie subsoils, previously found "raw" toward inoculated legumes, showed that an application of soluble potash and phosphoric-acid fertilizers removed this infertility, rendering the subsoils as productive as the corresponding surface soils. This is considered evidence that rawness in these soils is due to a lack of readily available mineral nutrients.

**The inhibition by stable manure of the injurious effects of alkali salts in soils**, C. B. Lipman and W. F. Gericke (*Soil Sci., 7 (1919), No. 2, pp. 105–120*).—Pot experiments conducted at the California Experiment Station are reported to determine the effect of stable manure on soil containing alkali salts as a medium for the growth of barley. The soil was a clay adobe, and the salts were tested singly at rates of 0.3 per cent each for sodium chlorid and sodium carbonate and 0.6 per cent for sodium sulphate. Stable manure was added at rates of 20, 40, 60, and 80 tons per acre, and four successive crops were grown in the same pots.

While no final conclusions are drawn, the data indicate that the tolerance of the barley plant to the toxic effect of salts is very much enhanced by the addition of organic matter in the form of barnyard manure. Culture pots containing sodium chlorid and sodium sulphate gave more definite results than those containing sodium carbonate. It is concluded that the data point to a practical application of this method of reducing the toxicity of alkali salts.

**Farm manure: Its production, conservation, and use**, E. O. Fippin (*Cornell Reading Course for the Farm, No. 127 (1917), pp. 37–72, figs. 16*).—This is a brief popular bulletin on the subject, prepared with special reference to New York conditions.

**Botanical composition of a permanent pasture as influenced by fertilizers of different compositions**, J. J. Skinner and C. F. Noll (*Soil Sci., 7 (1919), No. 2, pp. 161–175, figs. 7*).—The results of fertilizer experiments begun in 1910 (E. S. R., 35, p. 517) on grass on loam soil at the Pennsylvania Experiment Station are reported.

The fertilizers acid phosphate, sodium nitrate, and potassium chlorid were used alone and in combinations of twos and threes, the ingredients varying in 10 per cent stages. The total amount applied on each plat annually was 50 lbs. per acre of phosphate, nitrate, or potash. The plats were located in a pasture where the vegetation was originally Canada and Kentucky blue grasses, timothy, and white and red clover.

It was found that at the end of seven years the differently fertilized plats contained the various species in distinctly different proportions. Kentucky blue glass had become the predominant variety, while in the beginning Canada blue grass prevailed in larger proportion. Complete fertilizer mixtures high in nitrogen seemed specially favorable for the dominance of Kentucky blue grass over its competitors, while timothy was somewhat more favored by the fertilizers high in potash.

Grass generally had predominated over clover in the plats receiving fertilizers with high ratios of nitrogen, while clover and especially red clover had been crowded out of such fertilized plats. Clover had existed most easily in the plats fertilized with mixtures of phosphate and potash with no, or only a small amount of, nitrogen. The largest amount of clover occurred in the no-nitrogen series of plats, and decreased in the plats as the nitrogen content of the fertilizer increased. This was very marked in the case of red clover.

The soil of the plats receiving well-balanced mixtures of acid phosphate, sodium nitrate, and potassium chlorid, or mixtures containing principally

sodium nitrate, tended to remain neutral or become alkaline, but where no sodium nitrate or only a small proportion was in the mixture the soil became acid. The lime requirement increased as the proportion of sodium nitrate in the fertilizer mixture used decreased.

**Nitrate in Amargosa Valley, southeastern California** (*Amer. Fert., 49 (1918), No. 4, p. 32*).—Investigations by the U. S. Geological Survey on the nitrate deposits in the Amargosa Valley in southeastern California have led to the following conclusions:

"The nitrate in the Amargosa district occurs in a blanket of so-called 'caliche' about 5 in. in average thickness, which lies about 9 in. below the surface of the ground. The nitrate is accompanied by other salts, chiefly sodium chlorid. The soil above and the bedrock below the deposits contain insignificant amounts of nitrate. The high dip and the great thickness of the strata covered by the prospecting make it improbable that deeper beds of nitrate occur in this region. The caliche in general contains an average of less than 2.5 per cent of sodium nitrate, the areal distribution of which is uneven.

"The Zabriskie field, in which the newly found deposit was reported to lie, contains no commercially valuable nitrate. The Upper Canyon and Lower Canyon fields, the most promising in the Amargosa district, together contain, according to careful estimates, about 168 acres of niter-bearing deposits, which, if worked regardless of cost, might produce about 1,980 short tons of refined nitrate.

"The quantity of nitrate available in the Amargosa district is so small and the cost of production would be so great that the district as a whole can not be regarded as a source of commercial nitrate. No further work on the areas already examined is justified, except, perhaps, as purely scientific research. The occurrence of caliche nitrate deposits in the Amargosa district, rather than the usual cave or disseminated deposits, makes it seem possible, though improbable, that really valuable deposits of nitrate may occur elsewhere in the same general region. Prospecting should be continued until all similar deposits in other districts have been tested sufficiently to determine their value."

**Nitrogenous fertilizers: Their use in India,** C. M. Hutchinson (*Agr. Jour. India, 14 (1919), No. 2, pp. 203–214*).—From this discussion, it is concluded that nitrogen is required in Indian agriculture, but that other plant-food constituents are also needed, without which, in most cases, nitrogen would do more harm than good. It is stated, further, that India can not afford to import nitrogenous fertilizers at the same rate as other countries having greater mineral wealth and local consumption, but must depend rather upon a better utilization of indigenous supplies of nitrogen and upon more intensive methods of farming designed to maintain the fertility of the soil.

**Some information and suggestions concerning the use of phosphorus,** M. M. McCool, G. M. Grantham, and C. E. Millar (*Michigan Sta. Bul. 284 (1919), pp. 30, figs. 22*).—This comprises a general discussion of the terms used in connection with phosphate fertilizers; commercial phosphorus carriers; the effect of phosphate fertilization on crop growth and on the soil; the time, manner, and amount of the phosphorus application; the removal of phosphorus from different types of Michigan farms and the amount of commercial phosphate required to make good the loss; the amount of phosphorus in the surface layer of some typical Michigan soils; and results secured from the use of phosphate fertilizers on Michigan farms.

**Florida's soft rock phosphate** (*Com. Fert., 18 (1919), No. 5, pp. 36, 38*).—Experiments of one year's duration, conducted at the North Carolina Experiment Station, in which soft rock phosphate was compared with 16 per cent acid

phosphate on a soil poor in phosphates showed that soft rock phosphate was not so available to corn as acid phosphate, and in fact showed practially no availability except in one instance.

Effect of sulfofication and nitrification on rock phosphate, J. W. AMES and T. E. RICHMOND (*Soil Sci., 6 (1918), No. 5, pp. 351–364*).—Experiments at the Ohio Experiment Station, in which the effect of sulfofication and nitrification on the availability of rock phosphate were studied by incorporating sulphur, dried blood, and ammonium sulphate in silt loam and black clay soil, peat, and quartz sand, are reported.

In an acid soil the oxidation of sulphur proceeded vigorously, approximately 50 per cent being changed to the form of sulphate. While sulfofication was somewhat depressed in an acid soil by the addition of calcium carbonate, in sand mixtures the presence of calcium carbonate was essential. In the absence of other bases the calcium of rock phosphate did not serve as a base for the sulfofying process to any appreciable extent. The proportion of rock phosphate to soil was such that phosphorus was added at the rate of 1,900 parts per million. The oxidation of sulphur, incorporated with rock phosphate in the absence of calcium carbonate or nitrogen carriers, changed 630 parts of phosphorus into a form soluble in neutral ammonium citrate solution.

When calcium carbonate was added to the mixture prepared with an acid soil, the oxidation of sulphur had practically no effect on rock phosphate. In a basic soil the acidity resulting from sulfofication was partially neutralized by calcium naturally present as carbonate and in other combinations, so that the solvent action on rock phosphate was much less than occurred in the acid soil.

Ammonium sulphate affected the solubility of rock phosphate very little. Whatever action ammonium sulphate had is attributed to the sulphate ion rather than to biochemical action, since nitrification of ammonia did not occur in a soil deficient in bases unless calcium carbonate was added. Active nitrification of dried blood and ammonium sulphate occurred in the mixtures when conditions were favorable.

Nitrification was stimulated by rock phosphate to a very limited extent. This fact, independent of the results for either phosphorus or calcium solubility, is considered to be sufficient indication that the process has had no appreciable action on rock phosphate in soil.

Nitrification of dried blood, so far as the citrate soluble figures furnish evidence of availability, was not an active agent for increasing the solubility of rock phosphate mixed with soil. In the absence of rock phosphate or calcium carbonate, the nitrification of dried blood as well as the action of ammonium sulphate, independent of the oxidation of its nitrogen, increased the concentration of water soluble calcium.

More calcium was taken into solution from the soil than from added rock phosphate. This is considered to be evidence that the calcium of the soil, existing chiefly as silicates and partly in other combinations, is almost, if not altogether, as readily attacked as rock phosphate.

Effect of sulfofication and nitrification on potassium and other soil constituents, J. W. AMES and G. E. BOLTZ (*Soil Sci., 7 (1919), No. 3, pp. 183–195*).—A continuation of experiments at the Ohio Experiment Station on the effect of sulphur on soils and crops is reported (E. S. R., 39, p. 823), the results of which indicated that "nitrification of dried blood and oxidation of sulphur in soil mixtures increased the water-soluble potassium. The liberation of potassium was brought about by salts formed, rather than by the direct action of acidity on insoluble potassium compounds.

"Calcium nitrate was present where nitrification was stimulated by calcium carbonate. Ammonium sulphate was formed, by the reaction between sulphuric acid and ammonia from dried blood, where a deficiency of basic calcium compounds restricted the nitrification of ammonia. Considerable amounts of calcium, aluminum, and manganese sulphate were also present in certain mixtures.

"Ammonium sulphate, independent of the ammonia being nitrified, affected the solubility of potassium. Calcium naturally present in the soil as silicate and in other combinations was readily attacked by the acidity resulting from nitrification and sulfofication. Ammonium sulphate was also an active solvent of calcium.

"Magnesium compounds were much more resistant to the action of these solvent agencies.

"Large quantities of aluminum and manganese were converted into soluble forms where sulphur was oxidized in an acid silt loam soil. Small amounts of these elements were made soluble by this action in a basic clay. Nitrification had no effect on aluminum."

**Summary of the potash situation submitted by the Bureau of Mines and the Geological Survey of the Department of the Interior, June 1, 1919** (*Amer. Fert., 51 (1919), No. 2, pp. 39–42*).—This report states that the domestic potash industry has practically been the outgrowth of the war situation. The several domestic sources actually produced 54,562 tons of $K_2O$ in 1918, and the estimated capacity at the close of 1918 was 100,000 tons.

"Although the greatest output is shown for the western sources, they will be handicapped in competition with foreign potash by their remoteness from the market, the eastern potato and truck regions and southern cotton districts. The by-product sources, located mainly in the East, may be expected, when properly developed, to supply a large part of total requirements at competitive prices."

Data on cost and consumption are also presented.

**Some details about the Alsatian potash fields** (*Amer. Fert., 50 (1919), No. 3, p. 45*).—It is stated that there are at present approximately 100 fields in Alsace for which concessions for potash working have been granted, of which about 80 are considered workable.

"The thickness of the deposits in Alsace ranges from 2 to 10 meters [6.56 to 32.8 ft.]; the quantity is estimated at 1,472,058,000 tons of potash salts, which represents about 300,000,000 tons of pure potash. The advantages are that the deposits are uniform; the potash content with 15 to 20 per cent and more, on the average, is higher than in central Germany, and concessions are practically unnecessary for the disposal of the discharged water. On the other hand, the disadvantages are that it is difficult to produce sulphate."

**Potash content of blast furnace charges,** N. H. Gellert (*Com. Fert., 18 (1919), No. 3, pp. 74, 76*).—Analytical data are given which show that the iron ores ordinarily used in blast furnaces in the United States have contained from 0.29 to 2.07 per cent potash. Experience indicates that ores from the Lake district run low in potash (about 0.3 per cent), while foreign ores run high, particularly the manganese ores of Brazil, which usually contain 1 per cent and above. Indian ores rank next to the Brazilian ores in potash content, and Alabama ores are said to be quite high.

It is believed "that between 40 and 50 per cent of the potash charged into a blast furnace can be readily secured by the proper treatment of the charge and by proper collecting devices. The device that can most successfuly collect this potash with the greatest saving for blast-furnace operation is the Cottrell

electrical precipitator. Experiments conducted on a semicommercial scale indicate that such a collection is possible."

**Electro-potash, a Swedish potash fertilizer, and its effect upon mineral soils,** P. EHRENBERG ET AL. (*Jour. Landw., 66 (1918), No. 4, pp. 209–240*).—Pot experiments with wheat and buckwheat are described in which a comparison was made of a potash fertilizer designated as electro-potash with sulphate of potash and a 30 per cent potash salt in both limed and unlimed sandy and loam soils. The electro-potash, said to contain about 11 per cent HCl-soluble potash, is secured as slag after fusing either a granulitic rock or potash gneiss or feldspar with charcoal and iron ore in the electric furnace. The results are held to indicate that the new material is inferior to the two potash salts, both in its effect upon the yield of dry matter and its availability to the plant.

**The limestones of Canterbury considered as a possible source of phosphate,** L. J. WILD and R. SPEIGHT (*New Zeal. Jour. Sci. and Technol., 2 (1919), No. 3, pp. 180–192*).—The character, extent, and possible fertilizing value of these limestones are discussed. They are shown to contain variable amounts of impurities, mostly sand, but many of them contain sufficient phosphate to be of considerable importance for fertilizing purposes. Analyses of a number of samples of the limestones showed from 0.16 to 3.14 per cent of phosphoric acid, while certain of the nodules associated with the limestones contained from 10.6 to 51.8 per cent of tricalcium phosphate.

**The action of some common soil amendments,** J. E. GREAVES and E. G. CARTER (*Soil Sci., 7 (1919), No. 2, pp. 121–160, figs. 2*).—An extensive review of the work of the authors and others bearing on the subject is given, and experiments conducted at the Utah Experiment Station are reported on the effect of 17 different salts, including the sulphates of magnesium, calcium, manganese, and iron, the chlorids of sodium, iron potassium, magnesium, manganese and calcium, the nitrates of calcium, potassium, magnesium, and manganese, and the carbonates of manganese, iron, and magnesium, or the available nitrogen and phosphorus of soil.

It was found that the increased available nitrogen and phosphorus is sufficient to account for the noted increase in crop yields resulting from the use of these soil amendments. The increase in nitric nitrogen varied from 1 to 96.7 per cent. The water-soluble phosphorus was increased by all but 5 of the 17 salts, the increase varying from 0.2 to 15.5 per cent. Three of the salts which failed to increase the water-soluble phosphorus increased the organic phosphorus, hence the available phosphorus was increased by all but 2 of the 17 salts listed. The increase in organic phosphorus varied from 3.3 per cent with calcium sulphate to 62.6 per cent with manganese carbonate. The strong stimulant sodium chlorid acted to a great extent by rendering phosphorus soluble, whereas the equally strong stimulant calcium sulphate acted by rendering available more nitrogen.

**Use of sludge as a fertilizer,** F. T. HAMBLETON (*Engin. and Contract., 51 (1919), No. 18, p. 446*).—It was found that the expense of disposal of the sludge from a sewage plant yielding 500,000 gal. of sludge per year was met by the proceeds from the crops obtained from 6 acres of land to which the sludge was applied in liquid form. Mixing the sludge with phosphatic and potassic fertilizers gave even more profitable results.

**Fertilizers,** F. A. LÓPEZ DOMÍNGUEZ (*Porto Rico Dept. Agr. Sta. Bul. 18 (1919), Spanish Ed., pp. 79*).—This publication comprises a rather detailed but general discussion of the relations between plants, soils, and fertilizers, together with information relative to the regulation of the sale of fertilizers, particu-

larly in Porto Rico. Legislation pertaining to commercial fertilizers in Porto Rico is reviewed and various commercial fertilizer materials described.

The results of the actual and guaranteed analysis of commercial fertilizers and fertilizing materials examined during the period from July 1, 1917, to August 31, 1918, are presented in tabular form.

**The international movement in fertilizers and chemical products useful to agriculture, 1918** (*Internat. Inst. Agr. [Rome], Bur. Statis. Doc. Leaflet, 3 (1919), No. 5, pp. 44*).—Tables are given which include fairly complete data on production, trade, and prices for the years 1913 to 1918, inclusive.

## AGRICULTURAL BOTANY.

**[Plant studies]**, J. A. Harris (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 116, 117*).—This is a brief report of investigations along various lines, including osmotic concentration of vegetable saps, variation and correlation in plants, and variation, correlation, and selective death rate in garden beans.

**[Plant ecology]**, F. E. Clements (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 287, 288*).—The principles of synthetic ecology have served as a guide in the experimental work centered at the Alpine Laboratory on Pike's Peak and around Colorado Springs and Tucson. It has been recognized that animals contribute a factor of profound importance in all plant associations, and steps have been taken to begin a quantitative study of this influence. During the year emphasis has been laid upon plant indicators, climatic cycles, and grazing research. A notable feature is the employment of standard plants as indicators in the study of transpiration and rate of growth.

**The phytometer method**, F. E. Clements, J. E. Weaver, and F. C. Jean (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 288, 289*).—Batteries of standard plants, termed phytometers, have been installed and three series have been measured. The plants employed have been wheat, oats, sunflower, and raspberry (*Rubus strigosus*), all of these growing readily at different altitudes. The method promises to be of great value in interpreting climates and soils in terms of plant behavior and perhaps to exceed in value analysis by physical instruments. It should, it is thought, have wide application in dry land agriculture, grazing, and forestry in determining the possibilities of climates and soils and in definitizing the use of plant indicators.

**Permanent quadrats**, F. E. and E. Clements and G. V. Loftfield (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 295, 296*).—Progress is reported in the work of extending the number of quadrats for the exact quantitative study of climax formations and their succession. In the attempt to secure a record of the plant parts below ground a quadrat-bisect method has been devised by which depth, spread, and competition relations may be charted for wet and dry phases of the cycle.

**Ecology of root systems**, J. E. Weaver (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 291, 292*).—Examination of the root systems of a large number of dominant and subdominant species of important plant communities, with reference to their relation to the nature of the soil, the amount and penetration of the water content, and competition with each other, is said to have shown that the character and location of the root system were correlated with the water content in nearly all cases. Plains and prairies are much alike in regard to root behavior, except that roots of plains species tend to spread laterally while those of the prairie species go more directly downward. The great majority of the roots are highly plastic, those of ecads especially so, but some species, as *Kœleria cristata* and *Allionia linearis*, pos-

sess very stable root systems. A detailed study of roots begun in Washington and Idaho in 1914 is to be reported in a monograph on root systems.

**The influence of snow on the proportion of different vegetation at the same altitude in the Pyrenees**, J. Bouget (*Rev. Gén. Bot., 30 (1918), No. 358, pp. 305–320*).—It is stated that the distribution of vegetation among the high mountains is strongly influenced by the relief of the surface and by the duration of snow. At a given altitude, vegetation may be xerophilous on exposed portions and hygrophilous on the flat or depressed areas, with all intermediate gradations according to exposure. The upper limits of forests are determined directly by these influences. This fact is thought to preclude the possibility of restoring pine forests above the level of 1,800 meters (1.1 miles) on the north slope of the Pyrenees.

**Reciprocal transplants**, F. E. Clements and H. M. Hall (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 292, 293*).—A new method has been devised for transplanting related species and ecads to determine the effect of a change of habitat in causing adaptation and variation and in producing new forms. The essential feature is the reciprocal planting as illustrated, insuring an exact reversal of conditions and permitting a clear-cut demonstration of the extent to which the varieties are reversible as well as plastic. For the sake of detailed correlation, determinations of water content, light intensity, and air and soil temperatures are made at occasional intervals after the plants are fully established. Type specimens have also been preserved for comparison, and histological material has been obtained for studies of leaf and stem adaptation.

**Synchronism in plant structures**, J. M. Macfarlane (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 313–326*).—A detailed account of phenological and related events observed during several years (a considerable period being considered essential) states that for any one locality under like environmental conditions the average annual period of seed germination, leaf formation, blooming, dissemination of pollen, and other responses by flowering plants seem to be synchronous often to the day and even to certain hours of the day. In monœcious and dicœcious flowering plants, maturation of complemental floral organs seems to be affected in exactly synchronous relation, abundant pollination usually ensuing. A like principle apparently applies to the maturation and dispersal of spores and organs of conjugation. The behavior of plant hybrids suggests that each is a blended combination of parental characters as to period of living and defoliation, blooming and pollination, capacity for climatic resistance, and other phenomena, showing synchronous behavior, that is, a mean (all environmental factors being considered) between those of its parents.

**A study in the anatomy of hazel wood with reference to conductivity of water**, M. G. Holmes (*Ann. Bot. [London], 32 (1918), No. 128, pp. 553–567, figs. 10*).—The author describes a statistical method of investigating the constitution of wood from the standpoint of its efficiency for conducting water. This is an attempt to record definitely the number, size, and distribution of the elements in wood which are concerned in this process and to present the results in a graphical form. The method is designed to serve as a basis for correlating with anatomy the facts of specific conductivity as obtained by experiments.

In stool shoots of the hazel a very considerable variation has been observed in the constitution of the wood formed during the first season. On the whole, there is a general decline in total conductivity and a general rise in specific conductivity from the base of the shoot to its apex. The explanation offered is that these facts are related to the provision for other functions carried out by the wood and in particular to the greater proportion of mechanical elements in the lower part of the shoot supplying the necessary support in this region.

**The influence of immersion in certain electrolytic solutions upon permeability of plant cells,** M. Williams (*Ann. Bot.* [*London*], *32* (*1918*), *No. 128, pp. 591–599, figs. 2*).—In an attempt to discover what factors besides surface tension may be involved in alterations of permeability in plant cells and how far the time of immersion in a particular solution may be significant, the author has experimented with surface strips taken from leafstalks of *Saxifraga umbrosa* in solutions of electrolytes. He has found that immersion in these solutions rendered these cells permeable to 0.2 per cent ferric chlorid as indicated by reaction of the ferric chlorid with the tannin contained in the cells, the time required for the production of the abnormal permeability depending upon the concentration. Abnormal permeability to iron chlorid did not involve permeability to the rose-colored material which was observed frequently in the cell sap.

**Absorption of gold from colloidal solutions by fungi,** M. Williams (*Ann. Bot.* [*London*], *32* (*1918*), *No. 128, pp. 531–534*).—A study of *Penicillium glaucum*, *Oïdium lactis*, and *Aspergillus niger* in a series of gold solutions, gum arabic being added as a nutrient, showed that conidia of *P. glaucum* and *O. lactis* can develop in a colloidal gold solution containing tannin or gum arabic, the growing fungus taking up the metal and retaining it in noncuticularized cell walls. The process goes on more irregularly when masses of dead fungus are introduced. Coloration of the fungus is more intense in solutions having a higher rate of diffusion. In all cases a blue coloration finally results from the accumulation of gold.

**Behavior of stomata,** G. V. Loftfield (*Carnegie Inst. Washington Year Book, 17* (*1918*), *pp. 289, 290*).—The work here reported is said to be a continuation of that done in the Selby smelter investigation, some accounts of which have been previously noted (E. S. R., 37, p. 634). Forty species of crop plants have been studied to determine the relation of stomata to the injurious action of smelter fumes upon plant tissues. Similar studies were made at the Desert Laboratory on several species of xerophytes and winter annuals. In addition, particular attention was paid to the relation of the stomatal opening to transpiration and to wilting.

Results of the investigation seem to harmonize the diverging views as to the regulatory action of stomata, since they not only show that species exhibit extreme differences in the daily activity of their stomata but also that the upper and lower epidermis of the same species may vary considerably. Probably the most important result noted is that all the species studied with reference to wilting indicated that the stomata exercised a decisive regulatory action at this time, even in the case of those most passive under less extreme variations in the water relations.

**A contribution to the study of variations in respiration of plants as related to age,** G. Nicolas (*Rev. Gén. Bot., 30* (*1918*), *No. 355, pp. 209–225*).—The author has followed up work previously noted (E. S. R., 22, p. 327; 26, p. 628) with studies on different plants. He concludes that in the young organs, principally the leaves, intracellular oxygenation is more complete than in older organs. The younger tissues absorb much more oxygen than the more developed ones, while fixing relatively less, and thus set free larger quantities of energy which are utilized in growth.

**Transpiration of trees,** J. E. Weaver and A. Mogenson (*Carnegie Inst. Washington Year Book, 17* (*1918*), *pp. 290, 291*).—A comparative study of the transpiration in coniferous and deciduous trees was carried on at the University of Nebraska from September to May and at the Alpine Laboratory during June and July. These studies, employing *Pinus ponderosa*, *P. banksiana*, *Pseudotsuga mucronata*, *Picea engelmannii*, *Abies grandis*, *Acer saccharinum*,

*A. glabrum*, *Ulmus americana*, and *Quercus macrocarpa*, showed the daily transpiration loss from the conifers during autumn to be nearly twice as great as that from the deciduous species with the exception of *Q. macrocarpa*. The results indicated that the conifers studied were more xerophytic than the broad-leaved species during the summer, and that the needle habit was practically as efficient as the deciduous habit in preventing serious loss of water during winter.

**Light measurements.** F. E. CLEMENTS (*Carnegie Inst. Washington Year Book, 17 (1917), p. 291*).—A study of light intensity and quality on account of its relation to plant requirements and behavior is said to indicate that the intensity on heights such as Pike's Peak and Mount Garfield is scarcely or not at all higher than at points 6,000 to 8,000 ft. lower. This is supposed to be due to low humidity and the absence of dust and other impurities. Earlier observations have been confirmed that forest light is white light, containing the various rays in essentially a normal proportion, although sufficient tests have not been applied in such dense forests as those of cedar and hemlock on the Pacific Coast and of beech in the East.

**Photosynthetic efficiency.** F. E. CLEMENTS and F. LONG (*Carnegie Inst. Washington Year Book, 17 (1918), p. 289*).—Standard plants used as phytometers have served to show the photosynthetic behavior of different species in several habitats as well as the efficiency of each species in different habitats. Studies have also been made of the photosynthetic activity of ecads growing naturally in sun and shade and of paired species found in opposite light conditions. An attempt has been made to determine the rate of carbohydrate production during the day and its relation to the curve of daily light intensity. Factor readings have been secured, special attention having been paid to light intensity and quality. The method is expected to be valuable for use in forestry, where reproduction and growth are largely determined by the light intensity, also in permitting comparisons of the food-making efficiency of varieties of crop plants, as well as of native species.

**Experimental pollination.** F. E. CLEMENTS and F. LONG (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 293, 294*).—A method of experimentation designed to test the mutual responses of plants and insects is indicated, the results of which up to the present time are said to have thrown much light upon actual functions of flower parts, also to have furnished a large amount of interesting material on the habits and individuality of insects.

**Field and garden study of genera and species.** F. E. CLEMENTS and H. M. HALL (*Carnegie Inst. Washington Year Book, 17 (1918), p. 294*).—A general investigation of taxonomic criteria and study on the Madieæ in field and garden have been carried on for a number of years. The genera Chrysothamnus, Artemisia, Atriplex, and Haplopappus have recently been special subjects of inquiry into criteria and their application to the problem of distinguishing species from minor units. Field study of certain variants indicated has rendered it possible to make a working outline for the species and to relate the various segregates provisionally to them. This constitutes the basis for the application of statistical and experimental methods by which it is hoped to outline a synthetic system based upon relationship. It should not only permit the grouping of segregates of all sorts about the proper parent species, but should likewise determine the nature of the minor unit, whether variant, ecad, or mutant. At the same time it is proposed to furnish a convenient and accurate way of designating species and their minor units.

**Variation and mutation in Epilobium.** E. CLEMENTS (*Carnegie Inst. Washington Year Book, 17 (1918), p. 293*).—Studies continued for some years in connection with *E. spicatum* produced in earlier work an unusual number of ap-

parent flower and rosette mutants, which have been since grown under control, in order to ascertain the range of possible variation for accumulating and fixing characters. The present study is devoted to the isolation of pure lines and to the experimental production of mutants. Production of flower mutation by manipulating the flow of food to different parts through such means as pruning, mutilation, change of position, and correlation has proved unusually successful, and these plants are to be grown to determine the extent to which such artificial mutants are capable of being placed.

The inheritance of leafing time in the descendants from beeches differing in this respect, C. RAUNKIER (*Bot. Tidsskr., 36 (1918), No. 3, pp. 197–203*).—A study of beech trees in regard to their time of leafing shows that subspecies exist within the species *Fagus sylvatica* which differ markedly as to their time of leaf production, a correspondence existing between parents and descendants in this respect. It is thought, however, that the case is by no means simple as regards the inheritance of the genotypic factors involved.

## FIELD CROPS.

**Farm crops, their cultivation and management**, F. D. GARDNER ET AL. (*Philadelphia: The John C. Winston Co., 1918, pp. 288, pls. 2, figs. 122*).—This book, described as "a nontechnical manual for the cultivation, management, and improvement of farm crops," and based on practical experience and the results of agricultural research, is designed as a reference work for all engaged in farming. The work is divided into three parts, dealing with (1) the relation and cultivation of the various farm crops, (2) diseases and insect pests affecting the different crops, together with measures for their remedy and control, and (3) statistical information relative to cost of production, the fertilizing value and percentage composition of agricultural products, etc.

**Productive farm crops**, E. G. MONTGOMERY (*Philadelphia and London: J. B. Lippincott Co., 1918, 2. ed., rev., pp. XIX+501, pl. 1, figs. 208*).—This is a second and revised edition of a work previously noted (E. S. R., 35, p. 593).

[**Report of field crops work in Arizona**], W. C. HEARD (*Arizona Sta. Rpt. 1917, pp. 415–417, 418–426, figs. 5*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 39, p. 735) for the year ended June 30, 1917.

Variety tests with small grains on the Phoenix farm were limited to Early Baart wheat, Texas Red, and San Saba oats, and Wisconsin No. 6 and common 6-rowed barley, with yields ranging from 41 to 50 bu. per acre for wheat, from 93 to more than 100 bu. for oats, and from 40 to 65 bu. for barley which had been lightly pastured.

Hairy Peruvian alfalfa is said to have given better results than common alfalfa. Tests of 10 varieties of cowpeas and 14 of soy beans are held to indicate that these crops may become of considerable importance in the State. The more promising varieties of cowpeas included Red Ripper, Two Crop Clay, Iron, and Clay. Black Eyebrow and Ito San soy beans are deemed to be desirable early sorts, while Mammoth Yellow and Tarheel Black are especially promising among the larger, later kinds. White Canadian and Colorado Stock field peas seeded late in November and harvested for hay the following April produced 3,300 and 4,400 lbs. per acre, respectively. Garbanzos yielded at the rate of 2.5 tons of cured hay per acre.

Rhodes grass, Natal grass, and perilla, the last said to be native to Japan and of interest as a possible source of a linseed oil substitute, failed to give satisfactory results on the Salt River Valley farm.

In tests with fall-sown cereals on the Prescott dry farm, early planting of wheat and rye proved to be quite satisfactory, while later plantings were less so. Barley winterkilled completely, and emmer yields were small. Rye seeded early in rows 7 in. apart produced 3,200 lbs. of hay per acres and in 21-in. rows slightly less than 2,000 lbs. Similar plats allowed to mature grain yielded from 9 to 14 bu. per acre, while later plantings produced as low as 5.5 bu. per acre. The wheat yields amounted to about 2 bu. per acre more than the rye, but in no case was the grain of the best quality.

Sudan grass seeded in May produced approximately 2 tons of hay per acre in addition to a slight amount of pasturage. A portion harvested for seed yielded about 550 lbs. of recleaned seed per acre.

Plantings of different varieties of corn grown for forage produced from 2,960 lbs. of green fodder per acre for Reid Yellow Dent to 49,783 lbs. for Papago Sweet.

Field peas and beans were considerably damaged by rabbits and prairie dogs, and later by a bacterial blight said to be due to *Pseudomonas phaseoli*, which entirely destroyed the peas and greatly reduced the yield of the beans. It is deemed probable that the disease is identical with a similar infection appearing on the same field about three seasons before. The maximum yield of beans, 539 lbs. per acre, was secured from a planting of tepary. White sweet clover produced a fair stand but made meager growth the first season.

Variety tests with sorghums resulted in yields of green forage ranging from 1,259 lbs. per acre for feterita to 11,061 lbs. for Amber and 11,159 lbs. for Club-Top. Darso, a drought-resistant strain, developed by the Oklahoma Experiment Station, is said to have given encouraging results at Prescott.

Potato yields ranged from 920 lbs. per acre for a planting of Rural New Yorker to 4,011 and 4,122 lbs. for White Rose and Early Rose, respectively.

Seasonal conditions on the Sulphur Springs Valley dry farm are said to have been so unfavorable as to render the results of little value. Mexican June corn produced on the average 2,100 lbs. of green forage per acre; tepary beans sown as a catch crop after Sudan grass which had failed, 133 lbs. of seed, and after an indifferent wheat crop, 121 lbs.; and Dwarf Kafir and Club-Top sorghum 7,350 and 2,600 lbs. of green forage per acre, respectively.

Average crop yields on the university farm amounted to 4 tons per acre for alfalfa, 1 ton of hay per acre for barley, 5⅐ tons of green forage for corn, 70 bu. of mature corn, 6 tons of green fodder for feterita, and 5 tons for milo maize. Peanuts are thought to be well adapted to the soil and climatic conditions of the region.

**[Report of plant breeding work in Arizona]**, G. F. Freeman and W. E. Bryan (*Arizona Sta. Rpt. 1917, pp. 452–454, 456–461, figs. 3*).—Observations on selections of pedigree strains of alfalfa and hybridization and selection studies with tepary beans and wheat are briefly reviewed in continuation of similar work previously noted (E. S. R., 39, p. 736).

Individual selections from a strain of alfalfa originating from a single plant selection made in 1909 showed variations in the average yield per plant for three cuttings ranging from 0.3 to 0.53 lb. Different varieties of alfalfa seeded on ¼-acre plats in 1916 produced at the rate of from 7,723 lbs. per acre for Turkestan to 16,223 lbs. for European. Due to its productivity and hardiness, hairy-leaved Peruvian is said to be growing in popularity in the Southwest.

Results secured during the past three years in a comparative study of Arizona wheats are held to indicate that grain of excellent milling and baking quality can be produced on irrigated land in the State, and that there are marked differences in the bread-making qualities of different varieties grown under identical

conditions. Data obtained from milling and baking tests for 1915 and 1916 at the Kansas Station are summarized.

**Wyoming forage plants and their chemical composition, V**, F. E. Hepner (*Wyoming Sta. Rpt. 1918, pp. 117–128*).—Supplementing work previously noted (E. S. R., 25, p. 130), the author presents a tabulated statement showing the nitrogen content of 63 samples of grasses, rushes, and sedges collected at different altitudes ranging from about 6,900 to 10,000 ft., together with the nitrogen content of the soils upon which they grew. The average nitrogen content of all crop samples collected below 8,000 ft. elevation was 1.268 per cent, and that for all samples collected above 8,000 ft. was 1.385 per cent. Data relative to the total nitrogen content of soils from different altitudes were inconclusive, while nitrate determinations in several soils having approximately the same amount of total nitrogen but differing greatly in the amount of nitrogen in the plants grown thereon also failed to lead to any definite conclusion, the nitrate content being quite small in all cases. A complete analysis of some twenty-five of the soils by the strong acid digestion method failed to reveal any correlation between the nitrogen content of the plants and any of the soil constituents. It is concluded, therefore, that "the abundance of nitrogen found in high altitude grasses is not due entirely, if at all, to the greater amount of nitrogen, either total or nitrate, in the soils, nor is it due to excessive quantities of any other soil constituent." Other factors are believed to play a much more important rôle than does the soil in causing an increased storage of nitrogen by high altitude plants, although the author does not advance any theories as to what these factors may be.

Tabulated data are also presented showing the complete proximate analysis of the following plants: Western wheat grass (*Agropyron occidentale*), western couch grass (*A. pseudorepens*), slender wheat grass (*A. tenerum*), redtop (*Agrostis alba*), slough grass (*Beckmannia crucæformis*), grama grass (*Bouteloua oligostachya*), smooth brome grass (*Bromus inermis*), Porter brome grass (*B. porteri*), giant sedge (*Carex aristata*), mountain sedge (*C. festiva ebenea*), Nebraska sedge (*C. nebraskensis*), Alpine or cliff sedge (*C. scopulorum*), hillside sedge (*C. siccata*), bottle sedge (*C. utriculata*), variable sedge (*C. variabilis*), tufted hair grass (*Deschampsia cæspitosa*), spike rush (*Eleocharis palustris*), Macoun rye grass (*Elymus macounii*), reed meadow grass or manna (*Glyceria grandis*), squirrel-tail grass (*Hordeum jubatum*), wire grass or Baltic rush (*Juncus balticus*), long-styled rush (*J. longistylis*), knotted rush (*J. nodosus*), Merten rush (*J. mertensianus*), Richardson rush (*J. richardsonianus*), mountain timothy (*Phleum alpinum*), timothy (*P. pratense*), nodding blue grass (*Poa reflexa*), alkali meadow grass (*Puccinellia airoides*), American rush (*Scirpus americanus*), fine top salt grass (*Sporobolus airoides*), drop seed (*S. brevifolius*), downy oat grass (*Trisetum subspicatum*), Nevada blue grass (*Poa nevadensis*), and spike rush (*Eleocharis palustris*).

Brief descriptions of Macoun rye grass, Richardson rush, and American rush are included.

**Farm crops**, C. A. Zavitz (*Ontario Dept. Agr. Bul. 268 (1919), pp. 80, figs. 18*).—Variety, cultural, rotation, fertilizer, seed selection, and date of seeding tests with numerous field crops, including cereals, potatoes, root crops, field peas and beans, vetches, soy beans, cowpeas, corn, sorghum, millet, and sunflowers for seed and forage, and flax for seed and fiber, together with miscellaneous tests of mixtures of grains, grasses, and legumes for pasture, etc., are reviewed in connection with work in progress at the Ontario Agricultural College for several years. Much of this has been referred to from time to time in previous reports and bulletins.

**Hay and pasture crops, grasses, clovers, etc.**, C. A. ZAVITZ and W. J. SQUIRRELL (*Ontario Dept. Agr. Bul. 269 (1919), pp. 72, figs. 35*).—Twenty-six varieties of grasses and legumes suitable for hay and pasture are described and illustrated, and tests conducted at the Ontario Agricultural College with different pasture and hay crops, both singly and in combination, are briefly noted. Mixtures are recommended for annual, temporary, and permanent pastures.

**Field experiments [in Ireland], 1918** (*Dept. Agr. and Tech. Instr. Ireland Jour., 19 (1919), No. 2, pp. 180–208*).—Continuing work previously noted (E. S. R., 40, p. 434) this report describes fertilizer, variety, and cultural tests with potatoes, mangels, oats, turnips, and wheat.

**[Report of field crops work in Assam]**, J. W. MCKAY and A. A. MEGGITT (*Ann. Rpt. Agr. Expts. Assam, 1918, pp. 1–46+76–146*).—This comprises a detailed account of work previously mentioned (E. S. R., 40, p. 523).

**Legumes, Sudan grass, and cereal crops for silage**, C. H. ECKLES (*Missouri Sta. Bul. 162 (1919), pp. 3–25, fig. 1*).—Experimental work conducted during the period of 1913 to 1917, inclusive, is described in which observations were made on the relative value for silage of field peas and oats, soy beans, cowpeas, alfalfa, red clover, sweet clover, Sudan grass, wheat, and rye. The different materials were analyzed for total moisture, total dry matter, protein, ether extract, ash, crude fiber, and nitrogen-free extract when placed in the silo and again when the silage was removed from the silo. Small experimental silos previously described (E. S. R., 35, p. 270) were employed. The results secured are fully discussed, and may be summarized as follows:

Under proper conditions legume crops may be successfully preserved in the silo, although as a rule it is thought best to preserve them as hay on account of the much greater weight to be handled if put into the silo and the lack of suitable machinery for handling the green crop in the field. When legumes are put in the silo, in addition to ordinary precautions concerning the exclusion of the air, it is deemed essential that the proper amount of dry matter be present in the material. A dry-matter content of approximately 40 per cent was found to give the best results. It is stated that while legumes cut for hay may contain as low as 20 to 25 per cent dry matter, if put into the silo under these conditions the silage will have an extremely disagreeable odor when removed and be almost worthless for feeding purposes. The wide variation in results from using legumes for silage as reported in agricultural literature is believed to be largely explained by the dry-matter content of the materials used. Sufficient dry matter to insure proper preservation in the silo may be assured by allowing the crop to reach a suitable stage of maturity before cutting, or in case the crop has not attained the necessary maturity, by allowing the forage to lie in the field from five to six hours after cutting before putting into the silo.

It was found that ordinarily alfalfa could not be allowed to stand in the field until the proper stage of maturity was reached, and except in dry seasons when the dry-matter content of the plant is abnormally high it is recommended that it be allowed to lie in the field from four to six hours before placing in the silo. Canada peas and oats were in condition to go into the silo when the pea pods were becoming yellow and the oat heads were showing the first indications of ripening. Clover contained the proper amount of dry matter when allowed to stand until somewhat more than one-half of the blossoms were brown. Soy beans and cowpeas were ready for silage when the beans were well developed and the pods beginning to turn yellow. Due to wide variations in condition and time of planting, it is said to be necessary frequently to put cowpeas in the silo before the proper stage of maturity is reached, and that under such conditions partial drying in the field is essential to good results.

Silage from legumes, while superior in protein content, is somewhat inferior to corn silage in total digestible nutrients. With a proper amount of dry matter present, the loss of feeding value while in the silo was found to be no greater with legume silage than with corn silage.

Sudan grass was preserved readily in the silo with no special attention necessary to the amount of dry matter, its feeding value ranging from two-thirds to three-fourths that of good corn silage, depending upon the maturity of the crop when put into the silo. Wheat supplied a silage of reasonably good quality, having a feeding value approximately that of corn silage. It is stated that wheat should be put into the silo when the grain is in the dough stage, no special precautions being deemed necessary to insure proper preservation. Rye was preserved readily in the silo, but the resulting silage was not palatable. For best results rye should be put into the silo in the blossoming stage or earlier.

**Frost injury to grain and legumes**, H. Fischer (*Zentbl. Agr. Chem., 47 (1918), No. 7, pp. 212, 213*).—Observations on the effect of low temperatures on rye, oats, peas, and beans are noted, the author concluding that the death of the plant cell due to cold may be attributed to an irreversible mixture of the colloidal substance of the cell. The dark green color of the leaves accompanying frost injury was observed to occur with temperatures ranging from —4 to —6° C. (24.8 and 21.2° F. and to be complete at from —8 to —10°. The stems of the cereals showed some injury upon exposure to temperatures of from —4 to —6° and were frequently split with temperatures of from —8 to —12°, resulting in their subsequent collapse.

With temperatures of —8° or less, frosted spikes which were about to blossom showed marked injury, while spikes still remaining in the sheath were only slightly injured with temperatures of from —10 to —12°. Rye pollen from spikes cooled 12 hours at —8° still exhibited a few grains capable of germination, while exposure for 4 hours at —10° resulted in complete loss of vitality. Free pollen exposed to a temperature of —4° for 5 hours was entirely killed. The extruded stigmas of the rye blossoms were rendered unfruitful at —2°.

Ligowo oats showed the least injury from freezing of the four varieties studied. Although varying widely with different sorts, it is stated that in general the greater the frost injury the more vigorous was the development of new shoots.

**Soil inoculation for legumes**, W. A. Albrecht (*Missouri Sta. Circ. 86 (1919), pp. 15, figs. 6*).—This comprises a popular discussion of the nature, purpose, and value of legume inoculation, together with brief descriptions of the soil and pure culture methods.

**The improvement of the barley crop**, H. Hunter (*Dept. Agr. and Tech. Instr. Ireland Jour., 19 (1919), No. 2, pp. 139–159, pls. 10, figs. 2*).—The improvement of the crop in Ireland through pure-line selection and hybridization is described and some of the results secured indicated.

**Late planted variety tests of corn**, E. F. Cauthen (*Alabama Col. Sta. Circ. 41 (1919), pp. 4*).—Limited variety tests with corn, following a winter grain crop on sandy upland soil are held to indicate that certain varieties are better for early planting than for late planting. Station Yellow, Dwarf Mexican June, and Goliad are said to give good results with late planting, while large one-ear types, such as Henry Grady and Calhoun Red Cob, are regarded as unpromising. It is stated that the planting may be deferred until the latter part of June, although earlier planting is deemed advisable.

**Local fertilizer experiments with cotton in south Alabama, 1914–1918, inclusive**, J. T. Williamson and J. F. Duggar (*Alabama Col. Sta. Bul. 207 (1918), pp. 153–240*).—This bulletin reports the results of 44 conclusive fer-

tilizer experiments with cotton on Coastal Plain soils, conducted in cooperation with farmers for the period indicated in continuation of similar work previously noted (E. S. R., 30, p. 636). The results secured may be summarized as follows:

The average increase, following the use of cottonseed meal, was greater than that from acid phosphate in 68 per cent of the experiments, equal to it in 16 per cent, and less in 16 per cent. Cottonseed meal resulted in an average increase greater than that secured from kainit in 73 per cent of the tests, equal to it in 7 per cent, and less in 20 per cent. Acid phosphate surpassed kainit in 52 per cent of the tests, equaled it in 14 per cent, and was less in 34 per cent. With cottonseed meal as a basis, the relative increases in crop yields, due to the use of 200 lbs. cottonseed meal, 240 lbs. acid phosphate, or 200 lbs. kainit, were as 100:45:34. As an average of a much greater number of experiments, however, it is stated that potash is of much more relative importance, and acid phosphate slightly more so, than indicated above.

A 100-lb. application of kainit was found to be nearly as effective and, on the average, more profitable than a 200-lb. application. Nitrate of soda, applied at the rate of 100 lbs. per acre where the plants were from 6 to 8 in. in height to make a complete fertilizer, was found to be slightly more effective than a 200-lb. application of cottonseed meal applied in a complete fertilizer before planting. The maximum average increase in yield and the highest average profit were obtained from an application of 240 lbs. acid phosphate and 100 lbs. of kainit per acre before planting, and 100 lbs. of nitrate of soda when the plants were from 6 to 8 in. high.

**Transmission of characters in potatoes,** C. VON SEELHORST (*Jour. Landw., 66 (1918), No. 3, pp. 141–162*).—In continuation of work previously noted (E. S. R., 16, p. 360), the author presents further evidence regarding the transmission of yielding qualities in potatoes by the selection of seed from high-yielding strains. It is stated that almost always the use of small seed tubers from large mother plants resulted in higher yields than the use of large tubers from small plants. Furthermore, the yield expressed as a multiple of the seed employed increased markedly with a decrease in the size of the seed tubers.

**Missing hills in potato fields: Their effect upon the yield,** F. C. STEWART (*New York State Sta. Bul. 459 (1919), pp. 45–69, figs. 3*).—Experimental work conducted during 1918 is described in which an effort was made to determine how much of the loss in yield of potatoes, due to missing hills, is compensated by increased yields of the adjoining plants. Each of 360 tubers was divided lengthwise into two equal parts, and the resulting seed pieces planted in ten rows, 36 in. apart and 15 in. apart in the row in groups of four, with blank spaces of 30 in. between the groups. Each group contained the pairs of seed pieces from two tubers, so that one member of each pair adjoined a missing hill. The difference in yield between the exterior plant and its mate, the interior plant, was taken as a measure of the effect of the missing hill. Data were secured from 351 pairs of plants. As a check on the experiment, an attempt was also made to ascertain the extent of the variation in yield occurring between the plants from two seed pieces from the same tuber when grown under parallel conditions. For this purpose the pairs of seed pieces were planted 15 in. apart in two continuous rows without blank spaces, and data secured from 85 pairs of plants. The weight and number of tubers per plant are recorded in tabular form and the results summarized as follows:

Based on the weight of the total yield, the exterior plants outyielded the interior ones on the average 23.2 per cent, indicating that in the case of a skip containing a single missing hill, the two adjoining plants together make up 46.4 per cent of the loss in total yield, and a little more in the yield of market-

able tubers. Skips of more than one hill are deemed to be a total loss except for 46.4 per cent of the yield of one plant.

The number of tubers per plant was 20.7 per cent greater for the exterior than for the interior plants, and the tubers were larger on the average. The exterior plants produced on the average 5.6 marketable tubers, and the interior plants 4.7.

In all, 30 pairs of plants entering into the experiment were severely affected with leaf roll, and the influence of this factor on the results is discussed. It is stated that although the leaf roll plants were small, they did not have the effect of missing hills.

In the check rows, the differences in total yield between the different pairs of seed pieces ranged from 0 to 66.7 per cent of the mean yield of the two plants, the average difference being 20.7 per cent. Such wide differences are held to indicate that certain factors exist which have an important bearing on the yield of potatoes that are either unknown or underestimated.

Recognizing that the loss from missing hills probably varies considerably with the variety, the distance between hills, the character and fertility of the soil and cultural and meteorological conditions, a modification of the formula frequently used to obtain the so-called corrected yield to plat experiments with potatoes is deemed justified by the results of this experiment, whereby the estimated stand will be replaced by "stand value," the correct formula being $CY=\frac{\text{actual yield}}{\text{stand value.}}$ The stand value is to be calculated by means of the formula $SV=1-\frac{m-0.464s}{n}$, in which $m$ is the number of the missing hills per acre, $s$ the number of skips or series of consecutive missing hills per acre, and $n$ the number of hills per acre in a full stand.

**Handling and loading southern new potatoes**, A. M. Grimes (*U. S. Dept. Agr., Farmers' Bul. 1050 (1919), pp. 18, figs. 18*).—Factors contributing to loss in transit and in the market of southern new potatoes are outlined and methods of handling, packing, and loading the crop to minimize such losses described. Field cuts and bruises and exposure to the sun after digging are said to occasion considerable loss, together with improper methods of loading which permit shifting and breakage in transit. Double-headed barrels are said to be the most satisfactory container, while it is suggested that in loading provision be made for a maximum amount of ventilation throughout the load and for the prevention of shifting.

**Rhodes grass**, S. M. Tracy (*U. S. Dept. Agr., Farmers' Bul. 1048 (1919), pp. 14, figs. 3*).—The history and adaptation of Rhodes grass (*Chloris gayana*) are discussed, and field practices employed in growing and handling the crop both for hay and pasture are described. Proximate analyses are included.

**Élite culture and multiplication of some standard Ilocano and Tagalog lowland rices**, L. M. Romero (*Philippine Agr., 7 (1918), No. 5, pp. 149–153*).—In a continuation of work previously noted (E. S. R., 40, p. 336), the author describes the further propagation and multiplication of the best strains of Ilocano and Tagalog lowland rice secured through selection at Los Baños, P. I.

**Saving man labor in sugar beet fields**, L. A. Moorhouse and T. H. Summers (*U. S. Dept. Agr., Farmers' Bul. 1042 (1919), pp. 18, figs. 26*).—Labor-saving devices employed in the preparation of the soil, the cultivation and harvesting of the crop, and hauling the crop to the factory are described and illustrated for several important sugar beet areas in the United States.

**Bud variations in sugar cane**, C. S. Pomeroy (*Jour. Heredity, 10 (1919), No. 3, pp. 129–135, figs. 2*).—The author discusses briefly the bud origin of several

sugar-cane varieties on the basis of recorded observations made in Louisiana, the West Indies, Mauritius, Hawaii, and Australia.

Differences between mother plants and sports are said to be frequently as marked as between recognized varieties. Bud varieties have been recorded as differently colored side shoots from a single cane, differently colored canes in one stool springing from a single piece of plant cane, a stalk with some joints striped and some unstriped, strains showing differences in hardiness, and strains showing differences in sugar content. It is stated that plants grown from cuttings of bud sports tend to reproduce true to the character of the sport.

**Spacing experiments with sugar cane,** J. MIRASOL Y JISON (*Philippine Agr., 7 (1918), No. 5, pp. 127–136, figs. 2*).—Spacing experiments with sugar cane conducted at Los Baños, P. I., during the season of 1916–17 led to the following conclusions:

The percentage of germination increased as the planting rate decreased, with a corresponding decrease in the mortality of canes from two months of age to time of harvest. Close spacing resulted in tall canes of small diameter and small stools, while wide spacing resulted in larger stools and thick canes. The closest spacing with the cane laid end to end in rows 50 cm. apart (about 19.7 in.) resulted in the highest yield of cane, 82,000 kg. per hectare (36.49 tons per acre), while the maximum yield of sugar was secured from cane planted in rows 150 cm. apart with the seed pieces 50 cm. apart in the row.

**Sweet potato storage,** S. B. JOHNSON (*Arizona Sta. Rpt. 1917, p. 441*).—A comparison was made of sweet potatoes handled in the usual rough way and carried from the field in sacks with potatoes carefully placed in crates and cured in a room kept at a temperature of from 85 to 90° F. for one week, the two lots being subsequently stored in piles between layers of straw with a thick cover of straw.

It is stated that at the end of the storage period the first lot contained 38 per cent and the second lot 48 per cent of marketable potatoes. These results are held to indicate that in storing sweet potatoes out of doors the dry air is sufficient to cure them, and that to prevent excessive drying a layer of dry soil should be thrown over the pile after curing has been completed.

**The synthetic production of wild wheat forms,** H. H. LOVE and W. T. CRAIG (*Jour. Heredity, 10 (1919), No. 2, pp. 51–64, pl. 1, figs. 9*).—The authors describe a cross between the *Triticum vulgare* variety Early Red Chief and the *T. durum* variety Marouani, made at Cornell University, in which two plants similar in all respects to the typical wild wheat of Palestine appeared in a population of 113 individuals in the $F_2$ generation.

"These two plants . . . possessed the brittle rachis and long basal hairs or bristles. One form was beardless, while the other was partially bearded. The kernels were longer than in the other segregates and resembled the wild type. The heads were flat, similar to the true wild form. . . . The one main difference between the true wild wheat and these segregates was that the spikelets of the segregates were somewhat broader than those of the wild type. Each spikelet, however, carried away the joint of the rachis attached to it just as does the true wild wheat." The behavior of the progeny of these two plants in the $F_3$, together with a limited number of individuals in the $F_4$ and $F_5$ of one family, is described and their possible relation to the wild prototype discussed.

While the appearance of this wild form may be regarded as evidence in favor of the prototype theory in relation to the wild wheat of Palestine, the authors maintain that "the occurrence of wild segregates in the cross described does not prove that the wild wheat is the prototype of wheat, but rather raises the question whether it really is a prototype or a contemporary form. More data

from other crosses will be needed before any definite statement can be made. May it not be possible that there is a certain type (or types) in Palestine that, when crossed with others, may frequently produce the wild type?"

**Third biennial report State seed commissioner, 1917–18**, R. J. Leth (*Idaho Sta. [Pub.], 1918, pp. 12, fig. 1*).—This report, prepared by P. A. Wenger and C. B. Hobson, shows that 1,979,290 lbs. of agricultural seed was actually inspected during the biennium, that 3,037 samples were examined for purity, and that 310 samples were tested for germination.

## HORTICULTURE.

**Fruits, vegetables, and flowers**, F. D. Gardner et al. (*Philadelphia: The John C. Winston Co., 1918, pp. 279, figs. 135*).—A popular reference work on the culture of vegetables, fruits, nuts, and flowers prepared by a corps of specialists in the subjects presented.

In part 1, under the general heading horticulture, forestry, and floriculture, the successive chapters deal with the principles of vegetable gardening, the culture of specific vegetables, the farm vegetable garden, vegetable forcing, mushroom culture, medicinal and aromatic plants, growing fruit on the home plantation, the culture of small fruits, grapes, pome fruits, stone fruits, citrus fruits, nuts, miscellaneous tropical fruits, the farm woodlot, beautifying the home grounds, and window gardening. Part 2 comprises a treatise on plant diseases and insect enemies and their control. Part 3 contains tables of weights, measures, and agricultural statistics.

**[Fourth annual report of nursery and market garden experimental and research station in Hertfordshire in 1918]**, A. B. Lister (*Expt. and Research Sta., Waltham Cross. Ann. Rpt., 4 (1918), pp. 36, figs. 4*).—A progress report on cultural and manurial experiments with cucumbers and tomatoes (E. S. R., 40, p. 147). Some data are given on a study of sources of error and uncertainty in determining experimental results in the greenhouse with special reference to the position of the plants in the house. The study of the effect of sterilization on crop yield was continued. Of 6 methods of treatment applied in two houses, 5 of them yielded opposite crop results in the one house to what they did in the other, thus indicating that sterilization is of no benefit in producing greater crop yield other than in destroying disease organisms.

A progress report is made on a study by Mrs. D. J. Matthews of the use of sterilizing agents in the control of tomato soil pests. A preliminary note is also given on a study of methods of controlling the noctuid moth (*Hadena oleracea*).

**The evolution of the commercial greenhouse in relation to horticulture past and present**, W. R. Cobb (*Ann. Rpt. Hort. Socs. Ontario, 13 (1918), pp. 128–131, fig. 1*).—A brief review of some of the more important changes in greenhouse construction.

**[Report on experiments in lettuce growing]**, S. B. Johnson (*Arizona Sta. Rpt. 1917, pp. 434–441*).—Tests of the New York and Iceberg varieties of lettuce secured from several different seed firms and of 47 other varieties are reported in tabular form. The essential difference between seed of the same variety from different sources was the difference in germination percentage.

Experiments conducted with organic and inorganic fertilizers, though for the most part inconclusive, did show that the plat receiving stable manure at the rate of 20 tons per acre was the first to come to maturity and produced the best lettuce.

Under irrigation conditions planting the lettuce on ridges gave better results than planting on the level. Planting in single rows appears to be more

satisfactory than planting in double rows, under conditions where the price of land does not warrant hand cultivation.

Growing tomatoes for the canning factory, J. T. Rosa, jr. (*Missouri Sta. Circ. 87 (1919), pp. 16, figs. 4*).—Detailed cultural directions are given for growing tomatoes, including the control of pests.

The relation of phenology to fruit growing, R. J. Barnett (*Rpt. Proc. Mont. Hort. Soc., 21 (1918), pp. 102–113*).—A discussion of the influences of various climatic factors on fruit growing.

Roeding's fruit growers' guide, G. C. Roeding (*Fresno, Cal.: Author, 1919, pp. 101, figs. 123*).—A practical guide to fruit growing in California, including a discussion of the general principles of fruit growing, detailed directions for growing, harvesting, and handling the more important fruits, and briefer notes on those now grown to a limited extent. The text is well illustrated.

[Varieties of fruit for British Columbia], M. S. Middleton (*Ann. Rpt. B. C. Fruit-Growers' Assoc., 28 (1917), pp. 46–50*).—A discussion of the factors influencing the selection of varieties, including a suggested list of varieties for the different districts in British Columbia.

Our best varieties of fruit, J. Böttner (*Unsere Besten Obstsorten. Frankfort on the Oder: Trowitzsch & Son, 1918, pp. 80, figs. 42*).—Descriptions of the more important varieties of orchard and small fruits grown in Germany.

The improvement of fruit culture in Baluchistan, A. and G. L. C. Howard (*Fruit Expt. Sta. Quetta [India] Bul. 9 (1918), pp. 21*).—This paper presents the results of investigations carried out on the production of a supply of budded trees of good varieties for Baluchistan. The subject matter is presented under the following general headings: Stocks, the management of nurseries and methods of budding, and the selection of varieties. A list of imported varieties of fruit trees is included.

Annual report of the Fruit Experiment Station, Shillong, for the year ending June 30, 1918, C. H. Holder (*Ann. Rpt. Agr. Expts. Assam, 1918, pp. 47–75*).—A record is given of the varieties of orchard and small fruits planted under test at the station, including brief notes on their present condition.

Maintaining proper vigor in our fruit trees, C. I. Lewis (*Trans. Ind. Hort. Soc. 1917, pp. 93–113, figs. 2*).—A review of some of the more practical results secured by the Oregon Experiment Station relative to the interrelation of pruning, tillage, fertilizing, intercropping, moisture, etc., and proper vigor in fruit trees.

Summarized data are given on the results of orchard management experiments conducted at the Oregon Station during the four years 1914–1917 and the principal results secured, including also a summary of results secured by Kraus and Kraybill in their study with tomatoes (E. S. R., 40, p. 40).

Protecting the orchard by dusting, D. Reddick (*Trans. Ind. Hort. Soc. 1917, pp. 126–139*).—A summarized account of experiments conducted at the New York Cornell Experiment Station (E. S. R., 34, p. 738) and at other stations.

Orchard spraying experiments, A. G. Turney (*Ann. Rpt. Dept. Agr. New Brunswick, 1918, pp. 98–101*).—Data are given on cooperative experiments conducted in apple orchards in New Brunswick under the direction of E. G. Sanders.

The results, in general, indicate that it is practically impossible to control apple scab in ordinary years with repeated lime-sulphur sprays. A 3:10:40 Bordeaux mixture has proved a safe and efficient fungicide for the preblossom spray and a spray two weeks after blossom. The use of lime-sulphur at this period results in more or less injury to the fruit. Arsenate of lead as a spray after the blossom fall was an efficient but costly spray. Both lime-sulphur and Bordeaux used at this period result in more or less injury to the fruit.

Thus far no satisfactory sprays have been developed for the apple maggot, green apple bug, and plum curculio.

**Fertilizing of apple orchards**, E. J. KRAUS (*Trans. Ill. Hort. Soc., n. ser., 52 (1918), pp. 188–207, fig. 1*).—A consideration of various orchard practices, including fertilization, as factors in maintaining a proper balance between the nitrogenous and carbohydrate compounds within the tree. See also a previous note (E. S. R., 40, p. 147). In the discussion following is included a plan prepared by A. D. Shamel of arrangement of furrow-manure applications as recommended for citrus growers (E. S. R., 40, p. 246).

**Fertilization of apple orchards**, J. P. STEWART (*Trans. Ind. Hort. Soc. 1917, pp. 55–73*).—In this paper the author reviews the more practical results of orchard fertilizer experiments conducted under the direction of the Pennsylvania Experiment Station (E. S. R., 39, p. 445).

**Cultural methods and fertilization of the apple orchard**, J. OSKAMP (*Trans. Ind. Hort. Soc. 1917, pp. 73–84, figs. 3*).—A popular review of some of the more important results in orchard management at Purdue and other State experiment stations.

**Cost of producing apples in Illinois orchards**, H. R. STANFORD (*Trans. Ill. Hort. Soc., n. ser., 52 (1918), pp. 63–80*).—The cost data here presented are based on questionnaires sent out to a number of the representative orchard men of the State.

**A test of commercial fertilizers for grapes**, F. E. GLADWIN (*New York State Sta. Bul. 458 (1919), pp. 27–43*).—This comprises the results for the second 5-year period of an experiment started in 1909 (E. S. R., 31, p. 339), including also a summary of results from the work to date.

Nitrogenous fertilizers have continued to give the best results. Phosphorus and potassium have also had a marked beneficial effect upon wood growth, yield, and quality of the fruit, but have not influenced the quality to the same extent as the nitrogen. Nitrogen has not only affected the growth of the wood favorably, but it has increased the fruit and given larger berries and clusters. Potassium caused earlier ripening of the foliage than the other elements, but after the first few years the foliage has been of better color and size in the plats to which nitrogen was applied. The foliage on the check plat was inferior to the foliage on any of the fertilized plats.

All of the fertilized plats have produced a decided gain of fruit over the unfertilized plats, and with prices paid for fertilizers in 1914 as a basis the fertilizers have paid a good return on the investment. A comparison of the financial returns from the different plats indicates that the nitrogen applied in conjunction with either phosphorus or potassium, or with both, is worth something more than $100 per acre for the 10-year period. The author concludes that where all other fundamentals favorable to grape growing have been taken care of and the condition and production of the vines are still unsatisfactory, fertilizers should be applied. The evidence at hand suggests that a fertilizer containing a rather large percentage of nitrogen be used.

**Some recent marketing developments in the Pacific Northwest**, C. I. LEWIS (*Trans. Ind. Hort. Soc. 1917, pp. 193–206*).—The author describes the organization and status of the Fruit Agency, Incorporated, which was organized with the assistance of the Office of Markets of the U. S. Department of Agriculture in 1915 to promote cooperation between large individual operators, cooperative bodies, and other groups making a business of selling fruit.

**Tropical and semitropical fruits (exclusive of citrus fruits)**, E. O. FENZI (*Frutti Tropicali e Semitropicali (Esclusi gli Agrum). Florence: Ist. Agr. Colon. Ital., 1915, pp. 261, figs. 60*).—This manual has been previously noted in serial form (E. S. R., 34, p. 438).

Some profitable and unprofitable coffee lands, T. B. McClelland (*Porto Rico Sta. Bul. 21 (1919), Spanish Ed., pp. 15, pls. 2, figs. 5*).—A Spanish edition of the bulletin previously noted (E. S. R., 37, p. 43).

Effect of different methods of transplanting coffee, T. B. McClelland (*Porto Rico Sta. Bul. 22 (1919), Spanish Ed., pp. 12, pl. 1*).—A Spanish edition of the bulletin previously noted (E. S. R., 37, p. 649).

[Report on date investigations], R. H. Forbes (*Arizona Sta. Rpt. 1917, pp. 442–451*).—A review of crop conditions in the date orchards in 1915 and 1916, including information on present methods of ripening, packing, and marketing the crop. A statement of sales for the graded crop of a few leading varieties is given, together with a summary, by varieties, prepared by F. H. Simmons, of date crops borne at the Tempe orchard in 1915 and 1916. The summary is accompanied by brief notes on the quality and behavior of the different varieties for the two seasons.

Acting on the observations of San Francisco dealers, who found that the dates kept well in dry, cold storage, crates of different varieties of dates were packed for shipment and then placed in dry, cold storage in Phoenix at a temperature of 36 to 38° F. The date of storage was September 20, 1916, and the samples were examined at various times during a period of 14 months. The results as here tabulated show that all of the 10 varieties tested except 1, Hayany, kept well until February, and 1 variety, Iteem Joher, rich in sugar, kept perfectly for 14 months. The Rhars variety kept fairly well for this time also. These observations indicated that many varieties of dates may be harvested and held in storage for sale as fresh fruit, thereby avoiding overstocked markets.

A further experiment with the Hayany crop in 1917 was conducted by evaporating several samples of fresh fruit to 90, 80, 70, and 60 per cent of the fresh weight, and then putting them in dry, cold storage at about 34 to 36°. The results of examinations indicate that the fruit of this variety would have kept well at about 85 per cent of its fresh weight; while at 70 to 80 per cent it kept perfectly and was of superior quality after three months of storage.

In view of the very high percentage of mortality among date palm suckers distributed to individuals, distribution of suckers has been discontinued for the present, and suckers are now being rooted by the new method developed by the U. S. Department of Agriculture in the Coachella Valley (E. S. R., 36, p. 142.)

[Report of date breeding experiments], G. F. Freeman and W. E. Bryan (*Arizona Sta. Rpt. 1917, p. 455*).—Breeding work was started several years ago by the senior author, with special reference to securing Deglet Noor seedlings true to type. The orchard of seedling Deglet Noor dates planted at the Tempe Date Garden in 1912, bloomed and bore fruit for the first time in 1917. Forty-nine out of 235 trees bloomed, 22 of which were females and 27 males. Twenty-one females bore fruit; of these 10 bore fruit as light in color as the female parent, whereas the other 11 had fruits which were deep red when matured and black when ripe.

This indicates that the Deglet Noor variety is homozygous for the light colored fruit, whereas the Deglet Noor male seedlings used as a parent in this cross had for a male parent some dark colored date. It would also appear that the dark color of certain dates is a unit character.

As to quality of fruit, date of ripening, and response to the stimulus of heat in artificial ripening these seedlings varied widely. The quality was for the most part poor, although there were one or two rather promising trees, indicating that an amply sufficient number may be found among the 235 trees well worthy of selection as stocks for further breeding studies.

**Weather conditions as affecting plant growth**, J. J. THORNBER (*Arizona Sta. Rpt. 1917, pp. 428–430*).—Lists are given of ornamental trees and shrubs on the university grounds and at Tucson that were killed or more or less injured during the cold winter of 1916–17 when the temperature fell below 32° F., on an average of one out of every three nights, with minimum temperature of 9° F. A list is also given of ornamental trees and shrubs, mostly exotic, which were not injured in the least.

**A complete list of annual and other flowers, including greenhouse, tender and half-hardy perennials which, in Canada, can not be classed as hardy perennials** (*Ann. Rpt. Hort. Socs. Ontario, 13 (1918), pp. 74–78*).—The list here presented was prepared by the Committee on Names and Varieties of the Ontario Horticultural Association.

**The preservation of pollen for hybridizing**, A. P. SAUNDERS (*Bul. Peony News No. 6 (1918), pp. 2–9*).—A partial review of the literature on the preservation and viability of pollen of various plants which have been prepared for special use in hybridizing peonies. The author concludes that peony pollen under favorable conditions is very long-lived, and that there should be no difficulty in carrying it through the entire season from the earliest to the latest blooming species.

**Horticultural libraries in the United States**, M. F. WARNER (*Gard. Chron., 3. ser., 65 (1919), No. 1691, p. 247*).—This is largely a résumé of the scope of the horticultural literature in the library of the U. S. Department of Agriculture.

## FORESTRY.

**National afforestation**, A. D. WEBSTER (*London: T. Fisher Unwin, Ltd., 1919, pp. 160*).—In this work the author sketches the history of British woodlands, presents evidence to show the approaching dearth of timber, and makes an appeal for national afforestation in the United Kingdom as opposed to private and communal activities. Data are given on the cost of establishing plantations, with actual figures from English, Scottish, Welsh, and Irish estates, together with the details of afforestation practice, a list of the best trees for economic planting, and examples of financial returns. Recommendations relative to a national forest policy, the establishment of schools of forestry, and the use of unemployed labor in forestry are also included.

**Commercial forestry** (*Min. Reconstr. [Gt. Brit.], Reconstr. Prob. No. 11 (1919), pp. 14*).—This pamphlet is prepared with special reference to forestry problems in the United Kingdom. It discusses the position before the war, the position in 1918, the scope of commercial forestry, the renovation and extension of forest areas, and other important factors in a forest scheme. A concrete example of an afforestation scheme deemed suitable to the conditions of Great Britain is briefly outlined.

**Forestry**, S. HONDA and Y. TAKENOB (*Japan Year Book, 1918, pp. 562–569*).—A statistical account of the forests and forest industry in Japan.

**A forestry policy for New Zealand**, F. BELL (*Jour. Agr. [New Zeal.], 18 (1919), No. 5, pp. 313–318*).—An address given at the Conference of Crown Lands Commissioners, in which the author briefly discusses present conditions of forest management in New Zealand and presents suggestions relative to the foundation of a policy for the future.

**Reclamation of sand dunes**, E. P. TURNER (*Jour. Agr. [New Zeal.], 18 (1919), No. 3, pp. 148–154, figs. 3*).—Instructions are given for fixing and afforesting sand dunes under New Zeland conditions, together with a translation of an article by E. D. Van Dissel on the treatment of sand dunes in Holland.

**Vacation days in Colorado's National Forests** (*U. S. Dept. Agr., Forest Serv., 1919, pp. 60, figs. 24*).—A popular document describing the recreational features of the National Forests of Colorado, and giving information to campers relative to fire prevention and camp sanitation, camping outfits, rations, etc.

**Vacation trips in the Cochetopa National Forest** (*U. S. Dept. Agr., Forest Serv., 1919, pp. 14, pl. 1, figs. 6*).—A popular document dealing specifically with the recreational features of the Cochetopa National Forest of Colorado.

**The Ouray Mountains of the Uncompahgre National Forest** (*U. S. Dept. Agr., Forest Serv., 1919, pp. 14, pl. 1, figs. 6*).—A document similar to the above, dealing with the Ouray Mountains of the Uncompahgre National Forest in Colorado.

**A vacation land of lakes and woods.—The Superior National Forest** (*U. S. Dept. Agr., Forest Serv., 1919, pp. 12, pl. 1, figs. 6*).—A document similar to the above, dealing with the Superior National Forest in northern Minnesota.

**A historical review of the Bergius arboretum for the period 1885–1914,** R. E. Fries (*Acta Horti Bergiani* [*Stockholm*], *6* (*1918*), *No. 1, pp. 5–24, pls. 108*).—A progress report on activities at the arboretum of the Royal Swedish Scientific Academy at Stockholm. The report is accompanied by maps and numerous illustrations of the arboretum.

**Storied or tier-like structure of certain dicotyledonous woods,** S. J. Record (*Bul. Torrey Bot. Club, 46* (*1919*), *No. 7, pp. 253–273*).—A contribution from the Yale School of Forestry.

The author's studies show that storied or tier-like arrangement of part or all of the elements is characteristic of many dicotyledonous woods representing a wide range of natural orders and families. The storied structure is found also in the secondary phloëm. It is exhibited on longitudinal sections, typically the tangential, as fine transverse striations "ripple marks." "Ripple marks" were constant enough in stems of considerable thickness to serve as a valuable diagnostic feature. In some woods pit areas on the fibers were in seriation and the cells of the wood parenchyma strands are arranged in a secondary seriation, visible under the lens.

A table is appended giving for each wood the various elements storied, the uniformity and distinctness of the markings, and the height of the tiers. A list of cited literature is also included.

**Studies of regeneration conditions in Norrland pine forests, II,** H. Hesselman (*Meddel. Stat. Skogsförsöksanst., No. 13–14* (*1916–17*), *pt. 2, pp. 1221–1286, CXLIX–CLXVII, figs. 16*).—In a previous study[1] of regeneration in the pine forests of Norrland the results of which are here briefly summarized, the author concluded that the real cause of unsatisfactory regeneration in open lands adjoining the forests must be attributed to the unfavorable nature of the humus cover. The studies here reported at length were taken up from that point of view. The work is presented under the general headings of exterior hindrances to plant development, the growth of pine seedlings upon various parts of a forest, chemical analysis of the soils of pine forests, the nature and properties of the humus cover in various parts of a pine forest, cultural experiments, the cause of slow and unsatisfactory germination in the pine forests, and the management of pine forests on the basis of the evidence obtained in the studies.

**The arborescent indigenous legumes of Hawaii,** J. F. Rock (*Bd. Agr. and Forestry Hawaii, Div. Forestry Bot. Bul. 5* (*1919*), *pp. 53, figs. 18*).—In this paper the author has brought together the botanical information concerning the few endemic arborescent species of the family Leguminosæ found in the

[1] Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Wers. Anst. Schwedens), 1910, No. 7.

Hawaiian Islands. These include some species of Acacia and Sophora and single representatives of Mezoneurum and Erythrina.

**The production of aspen**, G. SCHOTTE (*Meddel. Stat. Skogsförsöksanst., No. 13–14 (1916–17), pt. 2, pp. 1205–1219, CXLVII–CXLVIII, figs. 5; also in Skogsvärdsför. Tidskr., No. 11–12 (1918), pp. 641–655, figs. 5*).—A preliminary study of production in several experimental stands of aspen leads the author to conclude that the aspen when grown on good soils in Sweden is a valuable tree that merits being well cared for. The aspen is used primarily in the match industry.

**The larch and its importance in Swedish forest economy**, G. SCHOTTE (*Meddel. Stat. Skogsförsöksanst, No. 13–14 (1916–17), pt. 2, pp. 529–840, LIX–LXXXIV, pls. 10, figs. 107*).—An account of the results thus far attained in the cultivation of different kinds of larches in Sweden, as studied in some 66 experimental plats, in mixed or pure larch stands, belonging to the Swedish State Institute of Experimental Forestry. Swedish literature dealing with the forest qualities of the larch is perused and cited almost in its entirety, and the foreign literature, especially German and English works, is also reviewed.

**The cultivation of osiers and willows**, W. P. ELLMORE, edited by T. OKEY (*London and Toronto: J. M. Dent & Sons, Ltd., 1919, pp. X+96, pls. 9*).—A practical treatise on willow cultivation and the preparation of osiers for market, based upon articles originally published by the author and editor in the *Journal of the Board of Agriculture*. The subject matter is discussed under the general headings of the cultivation of basket willows, expenses and returns, varieties of willows, preparation and marketing, insect pests of basket willows, and tree willows.

**Rubber plants**, H. M. HALL and F. LONG (*Carnegie Inst. Washington Year Book, 17 (1918), p. 297*).—An extensive survey of the Great Basin region for rubber-producing plants, begun in 1917 as a war emergency project, has broadened out during 1918 into a comprehensive search throughout the West. It is proposed to continue this work. Rubber has been found in 25 of the species examined, the percentage being sufficiently high in 11 species to justify further investigation, and sufficiently high in 4 to warrant the hope that these species may serve as a basis for rubber production on a commercial scale.

**A further note on thitsi (Melanorrhœa usitata), with special reference to the oleo-resin obtained from it in the Lawksawk and Myelat States, Southern Shan States Forest Division**, F. A. WRIGHT (*Indian Forest Rec., 7 (1919), No. 2, pp. 14, pl. 1*).—The present paper is supplementary to one previously issued on the same subject by Benskin and Rodger (E. S. R., 38, p. 247), and contains much information on the subject of tapping this species for oleo-resin.

## DISEASES OF PLANTS.

**Plant disease inquiries**, J. J. THORNBER (*Arizona Sta. Rpt. 1917, pp. 431, 432*).—The author reports the occurrence of a root rot of white sweet clover due to *Ozonium omniverum*, early potato blight, sore shin and angular leaf spot diseases of cotton, tomato wilt, a dry-rot disease of the potato caused by species of Fusarium, and a serious disease of date fruits. The last disease affects both green and ripe fruit at the Yuma date orchard, at least 90 per cent of the crop of the year being damaged. The fruits become mummified and acquire a bitter taste, thus being rendered unfit for use. Three species of fungi have been found associated with this disease, which is in process of further investigation.

**New or interesting species of fungi, IV**, H. D. HOUSE (*N. Y. State Mus. Bul. 197 (1917), pp. 25–51*).—Some of the fungi here named as new to the flora of New York, with brief descriptive discussion, are parasitic and a few may be of economic importance.

**On cell regeneration in Botrytis cinerea**, W. B. BRIERLEY (*Ann. Bot. [London], 32 (1918), No. 128, pp. 601–604, figs. 3*).—In the course of an investigation of *B. cinerea* the author noted that regenerative and related changes occurred in cells which had suffered division, severe flexion, or other injury. Recovery was observed. It is stated that the healing process and the rapidity of its occurrence depended largely upon age and condition of the cells involved, being hindered by starvation, for example. The regenerative response appears to be related largely to the condition of vacuolation of the protoplast. Types of injury stimulating a healing reaction are divided into acute cell flexion, punctures, and relatively large superficial lesions. It is thought that this potentiality, if widely distributed among the fungi, may have important bearings.

It is stated that certain hyphæ of *B. cinerea* in tissues of *Æsculus pavia* were found to be in a naked condition, existing as free protoplasmic substance. The author holds, however, that mycoplasm involves far more than the mere existence of fungus protoplasm in a naked state, and that the merging and subsequent dissociation of host and fungus must be regarded as not yet established.

**Blossom infection by smuts**, C. N. JENSEN (*Trans. Utah Acad. Sci., 1 (1908–1917), pp. 106–113*).—The author, summing up a review of work on smuts, states that, in addition to seedling infection, other forms exist, as blossom infection and leaf infection. As a rule, attack occurs only in very young embryonic tissues which are exposed at various points during growth. The flowering period offers an opportunity for infection comparable to that of seedling infection, so that these two distinct forms of attack at different periods have to be reckoned with.

**The black or stem rust of wheat** (*Canada Expt. Farms Bul. 33, 2. ser. (1917), pp. 15, fig. 1*).—An account is given of the nature and cause of the black stem rust of wheat, together with suggestions for its control. These include eradication of the common barberry, early sowing of wheat, and the use of early maturing varieties. Most satisfactory results have been obtained where early maturing varieties were sown on high or sandy lands.

**Destroy the common barberry**, E. C. STAKMAN (*U. S. Dept. Agr., Farmers' Bul. 1058 (1919), pp. 12, figs. 7*).—The relation of the common barberry as a carrying host to the black stem rust is pointed out, and its destruction is recommended as at least a partial means of reduction of loss in crops.

**The leaf-spot diseases of alfalfa and red clover caused by the fungi Pseudopeziza medicaginis and P. trifolii, respectively**, F. R. JONES (*U. S. Dept. Agr. Bul. 759 (1919), pp. 38, pls. 3, figs. 5*).—This bulletin is a contribution on the study of alfalfa and clover diseases being carried on cooperatively between the Bureau of Plant Industry of the U. S. Department of Agriculture and the Wisconsin Experiment Station.

The author describes the alfalfa leaf spot (*P. medicaginis*) said to be the most important foliage disease of alfalfa, and a similar leaf-spot disease of the red clover due to *P. trifolii*. Both fungi have been obtained and studied in pure culture, and efforts to cross these fungi from one host to the other have been unsuccessful. The author claims that morphological as well as physiological differences have been found which justify retaining the fungi as distinct species. No imperfect fungi which have been regarded as a stage in the development of these fungi have been found to be related.

The fungi are said to overwinter on dead leaves which escape decay, and the source of new infection is furnished by ascospores produced in the spring. Efforts to exclude the disease from alfalfa fields by the use of seeds that have been given surface sterilization were without success, and it is believed that the fungus is not carried on the surface of the seed and probably not with the seed at all.

**[Work in plant genesis]**, A. F. Blakeslee (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 114–116*).—Besides other more or less related matters, reports are made on the apparent immunity of adzuki beans to anthracnose in connection with their susceptibility to bean mosaic.

**Chlorotic corn**, W. H. Davis (*Proc. Iowa Acad. Sci., 24 (1917), pp. 459, 460*).—Observations on chlorotic progeny of seeds from an ear of yellow dent corn and on corn leaves pierced with needles which have been used to wound chlorotic leaves appear to show that corn embryos may be chlorotic, that chlorosis in corn is probably not transferable by contact or with the sap by way of wounds, and that corn plants which are entirely chlorotic will not mature.

**The influence of drought and of Alternaria on potato**, J. Sordina (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 6, pp. 131–134, figs. 2*).—The author notes, in connection with somewhat exceptional weather in exposed situations in the island of Corfu, the appearance of a potato disease apparently connected with *A. solani* which is discussed in relation with treatment. Two sprayings employing Bordeaux mixture at 1 per cent and 0.5 per cent, respectively, are considered as sufficient.

**The eradication of yellow stripe of sugar cane** (*Porto Rico Dept. Agr. Sta. Circ. 14 (1918), Spanish Ed., pp. 8, pls. 3*).—This circular includes an account by E. D. Colón of data and deductions regarding the yellow stripe disease of sugar cane noted by Stevenson (E. S. R., 38, pp. 851, 852), which is now causing much injury to the sugar industry in parts of Porto Rico. The disease is not curable by treatment or by improvement of cultural conditions. Varieties differ as regards susceptibility to the disease, which appears to be hereditary. The boundaries of the areas affected are being extended.

The second part of this publication, by F. S. Earle, deals with matters relating to control of the disease, which is said to be incurable as regards individual plants. The employment of strictly sound material for propagation, inspection of growing crops at frequent intervals, and eradication of all but unquestionably sound canes are relied upon to relieve the situation, which is declared to be critical.

**Blister canker of apple trees, a physiological and chemical study**, D. H. Rose (*Bot. Gaz., 67 (1919), No. 2, pp. 105–146, figs. 10*).—In a continuation of work previously noted (E. S. R., 34, p. 136), employing in this latter phase also the simplified Bunzel apparatus previously described, with the addition of a study of catalase activity with microchemical and macrochemical analysis of both healthy and diseased apple tree bark, the author claims to have found that apple bark attacked by *Nummularia discreta* approximately doubles the oxidation of pyrogallol, pyrocatechin, guaiacol, and benzidin, as compared with that occurring in healthy bark. The gradual slowing down of oxidation in the Bunzel apparatus is due, in part at least, to increasing H-ion concentration brought about by the oxidation process itself, the equilibrium reached in the apparatus being supposedly a false one, readily upset by addition of fresh oxidase reagent or plant material. The oxidase may be a catalytic agent. H-ion concentration is less in diseased than in healthy bark. Temperature and duration of drying have an effect on the acidity and the oxidase activity of both healthy and diseased bark. When oxidase is precipitated in two fractions the

first has more oxidizing power than the second, and both combined have more than either separately. A partial disintegration of cellulose is noted in diseased bark, also the disappearance of cyanogenic glucosid and a lower content of starch, calcium oxalate, and tannins. Diseased bark has a higher percentage of dry matter, lipoids, alcohol-water-insoluble residue, and total nitrogen than healthy bark. Other contrasts are detailed.

The greater oxidase activity of diseased bark is thought to be due to the combined activity of the oxidases of fungus and host, to lower acidity, and possibly to a greater degree of dispersion of the oxidizing agent. The lower tannin content of diseased bark is possibly another contributing factor.

**The effect of crown gall upon a young apple orchard**, L. GREENE and I. E. MELHUS (*Iowa Sta. Research Bul. 50 (1919), pp. 147–176, figs. 30*).—This bulletin is a record of progress in a study of the effect of crown gall upon an apple orchard from the time it was set out until it became of bearing age. Data have been collected on the relative influence of various types of galls upon the annual growth of the trees and on the amount and position of the galls in relation to the growth and percentage of stand in the orchard. The orchard in question was planted in 1912 with 310 trees infected with crown gall and 246 normal trees. The varieties Wealthy and Jonathan were used in the experiment, and at planting time it was noted that the Wealthy trees were infected with hard gall and very little hairy root, while the Jonathan were infected with both kinds of gall.

At the end of five years it was found that more of the crown gall infected apple trees were alive than normal trees, and the experiment confirmed the general idea that the variety Wealthy is more susceptible to crown gall than the Jonathan. In the experiment, the trees infected with gall did not show nearly so rapid growth as normal trees. Data are presented which show that crown gall greatly retards the growth activities of young apple trees, as manifested by a reduction in the amount of increase in trunk diameter, and in the number, length, thickness, and weight of twigs. It is claimed by the authors that twig measurement is a much more accurate and valuable index of the effect of crown gall than trunk diameter growth. Large galls appeared to be more injurious than smaller ones. Small galls on the underground portion of the tree did not seem to injure the twig growth materially. Fruit spurs developed earlier on badly infected trees than on the normal trees. Galls occurring on stock and union appeared to be equally harmful, while those on secondary roots were less so, and hard galls were less injurious than soft ones.

**[Spraying at the Neoga Station, Illinois, 1915–16]**, W. S. BROCK (*Trans. Ind. Hort. Soc. 1916, pp. 69–81, figs. 3*).—This includes a brief account, with discussion, of dust spraying for apple scab since its first employment about 1905 of a mixture containing fine sulphur 35 per cent, lead arsenate 15 per cent, and hydrated lime 50 per cent. Some details of the 1915 trials near Neoga suggest that the dust spray can compare favorably with the liquid form. A report is also given of the 1916 experiments at the same place, the main substance of which has been noted previously (E. S. R., 38, p. 551). There appears to be need of a better fungicide than powdered sulphur. Clean fruit can be obtained with standard liquid sprays if properly applied.

**Brown rot, its importance and control**, E. B. BENSON (*Ann. Rpt. State Hort. Soc. Mich., 46 (1916), pp. 44, 45*).—This is a discussion of brown rot (said to attack practically all varieties of peach, plum, and cherry) and of prevention thereof as regards orchard control and cooperation, particularly in regard to packing, loading, and shipping.

**Control of cherry leaf spot**, J. W. ROBERTS and L. PIERCE (*U. S. Dept. Agr., Farmers' Bul. 1053 (1919), pp. 8, figs. 6*).—A description is given of the leaf

spot of cherries due to *Coccomyces hiemalis*, formerly known as *Cylindrosporium padi*. For the control of leaf spot the authors recommend spraying sour cherries with lime-sulphur solution or Bordeaux mixture and sweet cherries with dilute lime-sulphur solution.

**Notes on vine black spot or anthracnose**, F. DE CASTELLA and C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria, 16 (1918), No. 7, pp. 420–425*).—It is stated that the fears expressed in the communication previously noted (E. S. R., 38, p. 853) have been fully realized, vine black spot or anthracnose having appeared with a virulence corresponding to the unusual humidity of the season and hitherto unprecedented in this State, but varying somewhat with different grape varieties. Although this is a slow spreading fungus as compared with Oïdium or downy mildew, it has been steadily disseminated through the agency of such carriers as birds and insects until it now constitutes a menace of extreme gravity. Modes of treatment as recommended are detailed for both winter and summer. Discussion is also given of cultural conditions considered as important in this connection.

**Black spot and leaf curl**, W. LAIDLAW and C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria, 16 (1918), No. 8, pp. 479–488, figs. 11*).—This is an account of experimentation covering four seasons, and at least in part reported elsewhere (E. S. R., 40, p. 749).

**Disease of the vine [New South Wales]: Downy mildew (Plasmopara viticola)**, H. E. LAFFER (*Agr. Gaz. N. S. Wales, 29 (1918), No. 8, pp. 581–584*).—Within the season of 1918 grape downy mildew (*P. viticola*) was identified throughout New South Wales and Victoria, the area affected being of very considerable extent. This fact tends to show that the disease has existed in that region for several years, having become noticeable as a consequence of unusual weather, the connection of which with the unusual development of fungus being briefly discussed as regards the life history of the organism. It is thought that under Australian conditions a 6:4:30 or even a 6:4:40 Bordeaux mixture might be sufficient for protection. One advantage of the treatment involving one or more applications as discussed herein is that grape downy mildew and black spot occur at the same period.

**Downy mildew [grape], Plasmopara viticola**, F. DE CASTELLA and C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria, 16 (1918), No. 9, pp. 568–574, figs. 6*).—It is stated that the foothold obtained in northeast Victoria by grape downy mildew (*P. viticola*) during the summer of 1916–17 permitted an early start for the disease in October, 1917, and resulted in a crop loss during 1918 generally estimated at 90 per cent, while some vines which were adequately sprayed showed a saving of 95 per cent of their crop. Contributory conditions are discussed. The standard spray, 2 lbs. copper sulphate to 10 gal. of water with enough good lime to neutralize the solution, is effective, but is much improved by the addition of casein at the rate of 1 oz. to 10 gal. of spray mixture in order to increase its spreading and wetting capacity. The life history of the fungus is outlined, and plans and results of spraying in other regions are briefly discussed.

**Copper fungicides for vine diseases**, F. DE CASTELLA (*Jour. Dept. Agr. Victoria, 16 (1918), Nos. 10, pp. 592–599; 11, pp. 674–678; 12, pp. 735–737*).—This is mainly a discussion of fungicidal mixtures based on copper, as regards their physical and chemical composition, properties, and effects, and of changes therein as produced by the aging of the mixtures.

**Comparative effect of basic and acid copper sprays**, J. CAPUS (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 6, pp. 129–131*).—Studies at least in part reported previously (E. S. R., 40, p. 850) showed that the efficacy of the five copper sprays employed (three containing lime and two soda) is much lowered

by abundant precipitation, but that for a long period of rainy weather (20 days) the alkaline are much more durable than are the acid sprays.

**Citrus spots and blemishes.** J. MATZ (*Porto Rico Dept. Agr. Sta. Circ. 16 (1919), pp. 8, pls. 3*).—Descriptions are given of some of the more common diseases to which citrus trees and fruits are subject, with tentative suggestions for control. Directions, based on recent experiments, are given for the identification and treatment of the different rots and blemishes of the trees.

**Coconut bud rot.** W. NOWELL (*Agr. News [Barbados], 17 (1918), No. 428, p. 302*).—Some particulars are given of the type of bud rot referred to in previous accounts (E. S. R., 40, p. 750). The type of bud rot occurring on the fruit stalks is believed to be of bacterial causation, but the characters of the organism held by different workers to cause this rot are said to differ widely. The symptoms and progress of the disease are briefly discussed. The treatment recommended adds to the usual plan of firing the dry matter in the top of the coconut tree a Bordeaux spray with 2 lbs. lead arsenate to each 50 gal. of spray in order to prevent weevil damage to the scorched tissues.

**Coffee leaf disease (Hemileia vastatrix) in Uganda.** S. SIMPSON (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 652–654*).—Coffee leaf disease (*H. vastatrix*) is stated to have been present in Uganda for many years, but no record exists, so far as known, of *Coffea robusta* in this region being attacked by any other species of Hemileia.

A note by W. Small states that the disease of cultivated coffee is probably the same as that which occurs on the native coffee, though experiments which are in progress to determine this point have given only negative results. The best results as regards protection have been obtained with Bordeaux or Burgundy mixture.

**Three sprays for coffee affected with Hemileia vastatrix and other fungus diseases.** W. J. DOWSON (*Nairobi, British East Africa: Govt., 1915, pp. 4*).—An account of tests carried on for two years in order to ascertain the most effective and economical spray against *H. vastatrix* and other fungus diseases on coffee states that all fungicides were effective, the dilute not less so than the ordinary sprays. Bordeaux mixture, which at the time of this report was cheapest at 0.25 strength, produced a marked invigorating effect not given by any other spray. The carbid mixture, though easy to prepare, was very expensive and gave the trees an unsightly appearance. Liver of sulphur, though easiest to prepare, was expensive and hard to obtain. Burgundy mixture proved to be expensive with no corresponding advantage.

**Report on white pine blister rust control, 1918** (*Amer. Plant Pest Committee Bul. 2 [1919], pp. 1–16*).—This report is published by the American Plant Pest Committee, formerly designated as the Committee on the Suppression of the Pine Blister Rust in North America (E. S. R., 39, p. 758). This committee is composed of four members from each American State and from each of the Canadian Provinces, and its purpose is to secure and disseminate information and to bring to bear measures looking to the eradication or control of dangerous plant pests, in particular to attack effectually any such pest in its initial stages and thus prevent its establishment. The publication gives in brief form the results of the third season's experiments and investigations by the persons responsible for them, as noted in some detail below.

White pine blister rust attacks 5-leaf pines only after a period of growth on Ribes, the total destruction of which is the only successful method of protecting pines. The maximum distance to which Ribes bushes must be removed does not exceed one-third of a mile under the most favorable conditions for infection. Ordinarily a distance of 200 yds. is probably sufficient to allow commercial growth of white pine. Pines of all ages are attacked, but older

trees survive longer than younger ones, which should be protected first to insure their reaching a marketable size. Cultivated black currants are specially susceptible to the disease, which is not prevented or cured by spraying on currant, gooseberry, or pine.

The activity of the committee has been extended to cover other new and introduced plant pests.

**Status of white pine blister rust control in 1918**, S. B. Detwiler (*Amer. Plant Pest Committee Bul. 2 [1919], pp. 4–11*).—This is a discussion, according to territorial sections or regions in the United States and Canada, of white pine blister rust and of matters relating to its control.

It is thought that thorough scouting and removal of Ribes once in five years in a space one-third of a mile wide around a pine growth will afford adequate protection to areas affected. In Rhode Island pastures where sheep were kept no Ribes were found even when these plants were abundant in areas of the same sort immediately adjoining. Apparently the majority of wild Ribes seeds are scattered by birds and squirrels. Observations made in New York confirm the opinion that wild gooseberries will not sprout if the crown is completely removed, although skunk currants and swamp black currants have underground stems which start new growth if not completely removed.

A summary is given of Ribes eradication on demonstration control areas in different States. It is thought that the hope of saving the western white pine forests from infection lies in the enforcement of the Federal and State quarantines against 5-leaf pines and Ribes.

Results of scouting in Canada are considered to show that the blister rust can not be eradicated at once from large areas where it is already abundant. Small trial areas are being systematically worked to determine whether or not white pine can be grown successfully in selected areas where the disease is present.

**Scientific research and field investigations in 1918**, P. Spaulding (*Amer. Plant Pest Committee Bul. 2 [1919], pp. 11–13*).—This contains a summary of the reports given by members of the Office of Forest Pathology, Bureau of Plant Industry, U. S. Department of Agriculture, regarding scientific studies on the white pine blister rust as carried on in 1918 at several places named.

Air currents are important agents for the dissemination of aeciospores, which were found in traps 2,700 ft. above the nearest known source, which was 5½ miles distant, this and other facts evidencing the extreme lightness of such spores. Apparently spores produced on pine are much more widely distributed than was formerly supposed. A large percentage of these will germinate even after a period of several weeks.

The spores of the early sumer stage on Ribes are much less widely distributed than has been supposed, 100 to 300 yds. being a common distance, and one-third of a mile somewhat unusual. They also retain their germinating power for a shorter period than do the spores produced on pines. A period of several rainy days is quickly followed by a new output of spores on Ribes. Studies from Ribes back to pine have not yet reached a very satisfactory stage.

The width of Ribes free zones necessary to protect the pines will vary from 100 to 600 yds. according to various conditions. Moisture is supposed to be an important factor in the survival of teliospores.

Overwintering of the uredo stage and resulting inoculation are considered as fully established. The incubation period on pine appears to vary from about 18 months to 15 years.

A Cronartium on Ribes in Colorado has been shown to be distinct from *C. ribicola*, and has been named *C. occidentale*. It attacks none of the 5-leaf pines and so far as known only the pinon pines (*Pinus monophylla* and *P. edulis*). A

comparison of these two fungi has been noted from another source (E. S. R., 39, p. 858).

Investigation [of white pine blister rust] in the Canadian Department of Agriculture, W. A. McCubbin (*Amer. Plant Pest Committee Bul. 2* [*1919*], *pp. 13, 14*).—Studies carried out in 1917 and 1918 show that uredospores and æciospores of the white pine blister rust fall through the air very slowly, so that their wide dispersal by air currents is possible. The fact that the effect of sunlight in inhibiting artificial inoculation is to be counted on only during the day decreases considerably the importance of this agency.

A survey of pine infection areas, made in order to ascertain the actual damage done by this disease, shows an average of 2.3 per cent infected, though the infection percentage recorded ranged as high as 33.54 per cent in one instance. Supposedly about 1 per cent of the pines have suffered new attack each year on the areas examined.

Apparently the principal factors to be reckoned with as regards pine infection include nearness and number of cultivated Ribes (particularly black currants) and the humidity of the area infested.

Artificial infection of Ribes species and white pine with Cronartium ribicola, G. P. Clinton (*Amer. Plant Pest Committee Bul. 2* [*1919*], *pp. 14, 15*).—A study has been made of the degree of infection produced on different species of Ribes grown in crocks. It was possible to trace the germ tubes of both the æcial and uredinial spores through the stomata into the leaf tissues, showing that the epidermis is probably not pierced in case of ordinary infection. Of 35 species of Ribes tested, 25 species were infected; with æcial spores, 24 plants out of 36 tests; and with uredinial spores, 40 out of 59.

Studies carried out during the fall of 1916 and 1917 on the infection of pines one to three years old by the telial stage gave as the first visible signs of infection the characteristic golden-yellow spots on the leaves, these being noted from 25 days to 6 months after the telia with sporidia were placed on the leaves. Microscopic sections show these golden-yellow spots to be filled with a sclerotial mass of mycelium more or less closely surrounding the fibro-vascular system. Strands of mycelium later run lengthwise near the bundles down the leaf into the stem, but cause no discoloration of the leaf. Inoculations of the young stems and unopened buds have not been successful. Within 6 months after infection the plants have oozed out pycnial spores, but no plants have yet matured the æcial stage. However, the plants thus far employed, being young, have mostly been killed by the fungus within one or two years after infection.

Summary of the white pine blister rust situation, H. Metcalf (*Amer. Plant Pest Committee Bul. 2* [*1919*], *p. 16*).—The results of work done to date are said to have shown that, even under unfavorable conditions, wild Ribes can be eradicated at a cost which is inconsiderable in comparison with the damage caused by the presence of this host of the white pine blister rust. It is, therefore, practical to plant white pine in the East if the areas are kept free from Ribes to a distance of one-third of a mile of the nearest pine. More and more stress must be laid on local control of Ribes, which has been shown to carry this disease through the winter.

Progress of experiments for destroying Ribes with chemicals, W. S. Regan (*Amer. Plant Pest Committee Bul. 2* [*1919*], *pp. 15, 16*).—Tests begun in 1917 show that in certain cases the chemical method possesses distinct advantages over hand pulling as a means of destroying Ribes. Undiluted fuel oil applied as a fine spray offers a most satisfactory means of this kind, a single thorough application producing defoliation, and under favorable conditions penetrating the bark and killing the plants. Direct sunlight favors and hastens this result,

which requires about 4 days in direct sunlight and 12 or 14 days in the shade, which is preferred by the skunk currants. Rain, occurring shortly after the treatment is applied, may to a great extent protect the buds and twigs. Individual plants differ considerably as regards resistance. Other and generally less effective sprays tested include sodium arsenite, salt solution, kerosene, and other compounds.

**Report of conference re disease attacking plane trees** (*Jour. Dept. Agr. Victoria, 15 (1917), No. 7, pp. 443–447, figs. 2*).—This is a report of the discussion at a conference of experts held on February 21, 1917, regarding a new and destructive disease attacking plane trees in many portions of Victoria, in some of which considerable injury was done. The causal fungus is *Glœosporium nervisequum* on leaves, *Myxosporium valsoideum* on branches. Recommendations regarding the control of the disease included early winter pruning, destruction of all prunings and leaves, spraying with Bordeaux mixture all winter and also upon resumption of growth in spring, and careful inspection of all nursery stock.

**Cultures with Melampsoræ on Populus**, J. R. Weir and E. E. Hubert (*Mycologia, 10 (1918), No. 4, pp. 194–198*).—The authors, reporting on further work with some of the fungi formerly studied (E. S. R., 38, p. 253), state that the rusts of Populus, hitherto distinguished as *Melampsora medusæ* and *M. albertensis*, are able to infect both Pseudotsuga and Larix. It is suggested that these two fungi are only different host manifestations of the same species, which should be referred to *M. medusæ*. Two new hosts recorded for this rust are *L. lyalli* and *P. macrocarpa*. New features are reported in regard to production of pycnia in the Melampsoræ.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**California ground squirrels** (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 11–12, pp. 593–807, pls. 6, figs. 67*).—A comprehensive account of the life histories, habits, and methods of control of ground squirrels in California is here presented as follows: Natural History of the Ground Squirrels of California, by J. Grinnell and J. Dixon (pp. 597–709); The Columbian Ground Squirrel (*Citellus columbianus columbianus*), by W. T. Shaw (pp. 710–720); A History of Ground Squirrel Control in California, by W. C. Jacobsen (pp. 721–761); A Study of Fumigation Methods for Killing Ground Squirrels, by J. S. Burd and G. R. Stewart (pp. 762–765); The Work of the Rodent Control Division, by S. V. Christierson and C. A. Wilkins (pp. 766–780); and Rodent Eradication Work of the Biological Survey in California, by F. E. Garlough (pp. 781–789). Directions and formulas for destroying noxious rodents and a complete index are included, as are colored plates of ground squirrels, by L. A. Feurtes and others.

**Destruction of live stock by predatory animals and their practical means of destruction**, M. E. Musgrave (*Proc. Ann. Conv. Ariz. Cattle Growers' Assoc., 12 (1919), pp. 111–113*).

**The principal species of birds protected by law in Egypt**, S. S. Flower and M. J. Nicoll (*Cairo: Min. Agr., Egypt, 1918, pp. IV+8, pls. 8*).—A list of the principal species, giving their English, French, Arabic, and scientific names, their local status, their approximate size, and concise notes on their coloration, for purposes of identification. Illustrations of 26 species in colors are included.

**Description of a new Conurus from the Andaman Islands**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), pp. 29–32*).

**An unrecognized shrew from Warren Island, Alaska**, H. H. T. Jackson (*Proc. Biol. Soc. Wash., 32 (1919), pp. 23, 24*).

**Mutanda ornithologica, VI**, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 32 (1919), pp. 21, 22*).

**Proceedings of the Entomological Society of Nova Scotia for 1918** (*Proc. Ent. Soc. Nova Scotia, No. 4 (1918), pp. 89, pls. 7*).—The papers here presented are as follows:

A Few Notes on Ant History and Habits, by H. J. Fraser (pp. 6–9); The Meaning of Natural Control, by J. D. Tothill (pp. 10–14); Further Notes on the Apple Magot (1918) (*Rhagoletis pomonella*), by W. H. Brittain (pp. 15–23); The Salt Marsh Caterpillar (*Estigmene acræa*), by H. G. Payne (pp. 24–31); A Copper Dust, by G. E. Sanders and A. Kelsall (pp. 32–37); Notes on the Life History and Immature Stages of Three Common Chrysomelids, by W. E. Whitehead (pp. 38–50); A Modified Bordeaux Mixture for Use in Apple Spraying, by G. E. Sanders and W. H. Brittain (pp. 51–61); Some Notes on *Olene vagans* in Nova Scotia, by W. H. Brittain and H. G. Payne (pp. 62–68); Some Miscellaneous Observations on the Origin and Present Use of Some Insecticides and Fungicides, by G. E. Sanders and A. Kelsall (pp. 69–75); Notes on *Lygus campestris* in Nova Scotia, by W. H. Brittain (pp. 76–81); Life History and Immature Stages of *Abbotana clematariæ*, by H. G. Payne (pp. 82–85); Key for Determining the Crambinæ of Nova Scotia, by E. C. Allen (pp. 86–88); and A Tree Hopper New to Our List, by W. H. Brittain (p. 89).

**Report of the imperial entomologist**, T. B. FLETCHER (*Sci. Rpts. Agr. Research Inst. Pusa, 1917–18, pp. 84–116, pls. 18*).—The author discusses the occurrence of and work with the more important insects of the year, particularly those attacking sugar cane and rice. Drawings illustrating the larval and pupal structure are presented of *Chilo simplex*, *Diatræa auricilia*, *D. venosta*, *Diatræa* spp., *Anerastia ablutella*, *Anomala biharensis*, *Adoretus caliginosus*, *Autoserica* sp., *Monolepta signata*, *Tirathaba* n. sp., *Calandra stigmaticollis*, *Eugnamptus marginatus*, *Azygophleps scalaris*, *Argyroploce paragramma*, *Nodostoma subcostatum*, *Balaninus c-album*, *Belionota prasina*, *Alcides frenatus*, *Giaura sceptica*, *Eublemma hemirhoda*, etc. Studies of the life histories and habits of various borers and root feeders of cane and rice are reported upon, as many as five new pests having come to light.

**[Economic insects in Sumatra]**, J. E. A. DEN DOOP (*Meded. Deli Proefstat. Medan, 2. ser., No. 3 (1919), pp. 20*).—The three papers presented are entitled Combating the Tobacco Aphid (*Myzoides persicæ*) in Deli (pp. 1–6); Notes on the Control of the Cigarette Beetle (pp. 7–18); and Brief Notes on the "Green Capsid" (*Gallobelicus nicotianæ*) (pp. 19, 20).

**Monthly notes on grubs and other cane pests**, J. F. ILLINGWORTH (*Bur. Sugar Expt. Stas. Queensland, Div. Ent. Bul. 7 [1919], pp. 29*).—This consists of monthly reports made by the author for August, 1917, to June, 1918, inclusive, relative to investigations of *Lepidiota frenchi*, *L. rothei*, and other cane pests.

**Insect pests of the avocado**, I. J. CONDIT (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 1, pp. 27–29, figs. 4*).—Brief reference is made to several insect enemies which occur in California and may become important as enemies of the avocado under California conditions, including a wood borer in the axils of the leaves identified as the twig borer (*Polycaon confertus*); a June beetle (*Serica alternata*), which injured the foliage at Fillmore; a species of thrips, undoubtedly *Heliothrips hæmorrhoidalis*, which was found infesting the leaves, and the citrus mealy bug.

**Some insects injurious to the black wattle (Acacia mollissima)**, C. B. HARDENBERG (*Union So. Africa, Dept. Agr. Bul. 1 (1918), pp. 62, pls. 21*).—A report of the work at the field station for the study of wattle insects at New Hanover, Natal.

**Linseed oil-Bordeaux**, E. W. BERGER (*Proc. Fla. State Hort. Soc., 30 (1917), pp. 44–47*).—In search for a mixture which would serve effectively as a fungicide and insecticide, 3 per cent raw linseed oil was mixed with strong Bordeaux (double strength and stronger) by stirring the oil into the Bordeaux. While the effect of this mixture on San José scale, purple scale, and citrus white fly on which it was tested has not been definitely determined, the linseed oil was found to have great value as a sticker for the Bordeaux, its presence being visible for five or six months. The efficiency did not appear to be diminished by the addition of the oil.

**"White ants" as pests in the United States and methods of preventing their damage**, T. E. SNYDER (*U. S. Dept. Agr., Farmers' Bul. 1037 (1919), pp. 16, figs. 11*).—A popular summary of information.

**Entomology**, A. W. MORRILL (*Arizona Sta. Rpt. 1917, pp. 472, 473*).—This report relates entirely to control work with the differential grasshopper (*Melanoplus differentialis*), the most destructive species in Arizona, a more extended account of which by the author has previously been noted (E. S. R., 39, p. 359).

**The black fly**, W. NEWELL (*Proc. Fla. State Hort. Soc., 31 (1918), pp. 90–96*).—A discussion of the status of *Aleurocanthus woglumi*, particularly as related to Florida. See also a previous note (E. S. R., 39, p. 864).

**The green soldier bug or pumpkin bug in citrus groves**, J. R. WATSON (*Proc. Fla. State Hort. Soc., 30 (1917), pp. 34–36*).—The author reports upon the results of a test to determine the actual cost of collecting the green soldier bug (*Nezara viridula*), made on a 200-acre grove, and to try out on a large scale several different types of nets. The trees in the orchard were 10-year-old trees, set 20 by 30 ft., and averaged from 30 to 100 bugs per tree, 97 per cent of which were *N. viridula*.

It was found that the nets should be at least 3 ft. in diameter and of equal depth, having a short handle which extends across the diameter of the net to stiffen the rim, which is of telephone wire. One man can manipulate the net, although two work to better advantage, one holding the net under a limb full of fruit and the other giving the limb a vigorous shake, causing the bugs to drop and roll to the bottom of the net. After finishing each tree the tip of the net with the contained bugs is dipped into a bucket of kerosene, which keeps the net constantly wet with the oil.

It is stated that in the experimental grove it cost between 30 and 75 cts. per acre to collect the bugs. Two men working together cover an acre in from one to two and one-half hours, depending on the amount of fruit and the number of bugs present. The author considers this the most satisfactory method of dealing with the green soldier bug thus far devised. Larger nets can be used early in the morning, on moonlight nights, and on cold days.

**The grain bug**, D. J. CAFFREY and G. W. BARBER (*U. S. Dept. Agr. Bul. 779 (1919), pp. 35, figs. 13*).—This report is based upon observations by the senior author in 1915 and the junior author in 1916 during a destructive outbreak of *Chlorochroa (Pentatoma) sayi* in northeastern New Mexico and adjacent territory.

Since 1911 it has become a serious enemy of wheat and other small grains in the intermountain and southwestern States. "The most important damage is caused by the insect piercing the newly-formed heads of various cereals and removing the liquid contents, thus preventing the formation of the grain or greatly reducing its weight. The reduction in yield from grain-bug attack varies from 10 to 50 per cent of the crop. In extreme cases the entire crop may be destroyed.

"The cultivation of large areas formerly devoted to grazing eliminated the native food plants of the insect and caused it to attack cultivated plants. This change to more succulent food plants, together with the superior facilities afforded for hibernation in the cultivated areas, resulted in an increase of the pest beyond its former abundance. Wheat, barley, and rye are the preferred food plants among the cultivated crops. The species also feeds upon other cereals, and upon alfalfa, cotton, peas, beans, cabbage, tomato, and lettuce, in addition to many native plants. The first recorded damage occurred in 1903, and since that time destructive outbreaks have been reported from most of the States west of the Great Plains area. Weather influences and the work of the parasites generally restrict destructive outbreaks in each locality to periodic intervals of two or three years.

"Adults emerge from hibernation in the early spring and deposit eggs on the material composing the hibernating quarters. The resulting nymphs feed upon tender plants growing in the vicinity. Upon reaching maturity the adults migrate to grain fields and feed upon the developing heads. There are three distinct generations and sometimes a partial fourth generation annually. About 50 days are required to complete the life cycle of each generation.

"After midsummer the numbers of the insects are greatly reduced by an egg parasite, *Telenomus ashmeadi*, and by two species of tachinid parasites, *Gymnosoma fuliginosa* and *Ocypterodes euchenor*, which parasitize the adults. Several kinds of predacious enemies contribute to the same result.

"Hibernation occurs in the adult stage under weeds or rubbish. No nymphs or eggs survive the winter. Severe winters result in the death of a large percentage of hibernating adults and constitute one of the most important factors in restricting destructive outbreaks of the species. During normal winters at least 95 per cent of the adults survive when hibernating in protected locations.

"The most effective and practical method of control is the destruction of the adults while they are concentrated in their winter quarters. This is best accomplished by plowing under, or burning, all rubbish and weeds, particularly Russian thistle, in and about cultivated fields. These control measures should be included as a part of the regular farm practice, and any special work required may be carried on during the inactive season at a time when the farm labor and equipment ordinarily are idle. Trap crops, hand picking, and hopperdozers might prove practical in the control of the insect under special conditions."

**Five new species of Jassoidea from Honduras (Hemiptera: Homoptera).** E. H. GIBSON (*Proc. Biol. Soc. Wash., 32 (1919), pp. 25–28*).

**Combining dormant and first summer spray in apple orchards infested by San José scale.** T. J. TALBERT (*Missouri Sta. Bul. 161 (1919), pp. 3–15, figs. 3*).—This is a report of experiments and observations, extending over a period of four years, which have shown that the dormant or San José scale spray consisting of commercial lime-sulphur testing 33° B. may be applied to apple trees at a dilution of 1:7 or 1:8 after growth starts and until the trees begin to bloom without material injury to leaves or flower buds. When applied after the leaves are out and the buds are beginning to show their petals, it takes the place of the so-called cluster-bud or first summer spray, thus eliminating the cost of labor and materials for one summer application.

"Commercial lime-sulphur when used at a dilution of 1:7 produces more burning than when used at a dilution of 1:8, 1:10, or 1:12. As a rule, the weaker the solution the less the burning. The difference in the caustic or burning effect, however, has been very slight, especially between the dilution of 1:7 and 1:8. A spraying pressure of from 250 to 300 lbs. is much more apt to cause injury by burning than a pressure of 200 lbs. or less."

When the strong spray is applied at the cluster-bud period, it is very effective in killing San José scale. The bark of the infested trees is left covered with a strong spray, and the young scales which are produced later have considerable difficulty in finding suitable places to settle down and begin sucking sap.

The late concentrated spray has also been found to be of great value in controlling aphids or plant lice, oyster-shell scale, scurfy scale, Forbes scale, spring canker-worm, bud moth, and other sap-sucking and leaf-eating insects, which are killed through contact with their bodies. It is said to be effective in controlling apple scab, and is believed to be effective against other fungus diseases, such as Illinois canker, black rot, etc.

**The fruit worms of the apple in Nova Scotia**, G. E. Sanders and A. G. Dustan (*Canada Dept. Agr., Ent. Branch Bul. 17 (1919), pp. 28, figs. 9*).—This is a report of studies of fruit worms, which are a source of an immense amount of damage in Nova Scotia and throughout eastern Canada. The adults of nine species were found to feed on apple foliage and fruit, and the adults of eight others were taken in apple orchards, though attempts to rear them on apple foliage failed.

Technical descriptions are given of the several stages of the nine species treated in this bulletin, namely, *Graptolitha bethunei*, *G. laticinerea*, *G. antennata*, *G. georgii*, *G. bailegi*, *Conistra walkeri*, *Xylena nupera*, *X. cinereitia*, and *X. curvimacula*, together with notes on *G. ferrealis*, *G. disposita*, *G. unimoda*, *G. fagina*, *G. pexata*, *G. petulca*, *G. cinerosa*, and *G. innominata*.

"The fruit worms of the apple are responsible annually for a large amount of damage in the apple orchards of Nova Scotia. The injury is effected by the larvæ eating into the young fruit or the set of the apples, causing about 72 per cent of the injured fruit to drop, and deforming about 78 per cent of the remainder enough to cause it to be degraded to No. 3 and culls.

"The adults of the fruit worms are strong flying moths which are to be found on the wing during September, October, April, and May. They deposit their eggs on the twigs of the apple during the month of May. These eggs hatch about the time the apple buds are beginning to show pink. The young larvæ feed for the first two weeks on apple leaves and blossoms and drop to the ground very readily when disturbed. After the first two weeks the larvæ feed more on the fruit of the apple than on the leaves, causing an immense amount of injury, as previously indicated. In early July the larvæ enter the earth to pupate, and form an almost naked pupa 2 or 3 in. below the surface. In September and October the adult moths emerge and during the winter hibernate under tufts of grass, etc."

The investigations show an arsenical spray applied immediately before the blossoms open to be the most valuable spray in fruit-worm control, while that applied immediately after the blossoms fall is the next in value.

**The tea tortrix (Homona coffearia)**, N. K. Jardine (*Dept. Agr. Ceylon Bul. 40 (1918), pp. 32, pls. 2, figs. 2*).—This is a preliminary report of investigations during the year 1917–18 of *H. coffearia*, which is distributed over the entire southern half of the Central Province of Ceylon and is a serious enemy of tea. A list is given of the food plants, representing 14 orders, on which it has been found to propagate.

**Pseudograsserie, a new disease of caterpillars of the gipsy moth**, A. Paillot (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 4, pp. 258–260*).—The author describes a disease of the gipsy moth which presents symptoms resembling grasserie and flacherie, and to which he gives the name pseudograsserie. The gipsy moth was found to be infected by two coccobacilli to which the names *Bacillus lymantriæ adiposus* and *B. lymantriæ β* are given, of which the first is the cause of the disease here considered. The disease was reproduced in

caterpillars of *Vanessa urticæ*, brown-tail moth, and silkworm by inoculation. The cultural characteristics of the bacillus are described.

**Reports and papers on malaria contracted in England in 1917** (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., No. 119, abridged ed. (1918), pp. IX+55, pls. 6*).—Included in this report are a paper by A. J. Grove on English Mosquitoes (pp. 44–50), tables showing recorded observations of anophelines in England (pp. 51–53), and General Abstract from a Report to the Army Medical Department on the Mosquito Survey of the Aldershot District, by A. C. Parsons (pp. 54, 55).

**The cabbage fly (Chortophila brassicæ)** (*Meded. Phytopath. Dienst Wageningen, No. 8 (1919), pp. 18, pls. 3*).—A report of studies of *C. brassicæ*, the injury which it causes, and control measures employed.

**Eumerus strigatus again**, C. L. METCALF (*Ent. News, 30 (1919), No. 6, pp. 170–174*).—The author presents records of the occurrence of the lunate onion fly which supplement the paper by Weiss and Nicolay previously noted (E. S. R., 40, p. 654).

**Protection from the locust borer**, F. C. CRAIGHEAD (*U. S. Dept. Agr. Bul. 787 (1919), pp. 12, pls. 3*).—The author reports at length upon investigations which have shown it to be practically certain that plantations of the black or yellow locust (*Robinia pseudacacia*) can be protected successfully from the locust borer (*Cyllene robiniæ*) and grown profitably on a commercial scale if the locusts are planted in thick stands or mixed with other trees so as to produce a densely shaded condition and natural pruning during the first 10 or 15 years of growth. It is said to be very essential that the shade be present after the trees reach 1.5 to 2 in. in diameter, and that it be continued until they attain 5 or 6 in., after which thinning and pruning can be done with little or no subsequent injury by the borers.

"That difference in site or locality is not the influencing factor in the growing of uninjured trees is evident from the fact that in every locality examined it was possible to find examples of borer-free and destroyed trees growing 100 yds. apart. It is also evident that goldenrod is not necessarily associated with greater damage by the borer, for in the same abandoned field, massed with this plant, were found plats of trees absolutely free from injury and near-by isolated trees badly infested. Again, localities where no goldenrod is growing may have borer-infested trees, the adults feeding on other composites."

Among the other recommendations are that locust plantations be gone over and the broken-down and infested trees removed and burned during the winter. If the cutting out of the infested trees can be done early in November, it is not necessary to destroy or burn the wood.

It has been found that the young borers can be killed readily by the use of an arsenical spray, consisting of 0.25 lb. of sodium arsenite or arsenate in 5 gal. of water to which 1 qt. of miscible oil is added and agitated thoroughly, applied to the bark when the new growth begins to open at the tips of the twigs in the spring. Kerosene emulsion may be used in place of the miscible oil to carry the arsenical, 1 gal. of the stock solution being added to 0.25 lb. of the arsenical in 4 gal. of water.

**The confused flour beetle (Tribolium confusum)**, R. N. CHAPMAN (*Rpt. State Ent. Minn., 17 (1918), pp. 73–94, figs. 10*).—This is a report of work at the Minnesota Experiment Station with the confused flour beetle, which has six larval instars. The relative infestation of wheat flour and wheat flour substitutes and their relative susceptibility are considered at length, together with measures of control, a discussion of which by the author has been previously noted (E. S. R., 40, p. 59).

**Shot-hole borer (Xyleborus fornicatus)**, E. R. Speyer (*Dept. Agr. Ceylon Bul. 43 (1919), pp. 16, pls. 2*).—A discussion of the treatment of tea prunings on estates infested with the shot-hole borer (*X. fornicatus*).

**Report of the State apiarist for the year 1917**, F. E. Millen (*Rpt. State Apiarist Iowa, 6 (1917), pp. 89, figs. 12*).—This consists in large part of the proceedings of the sixth annual convention of the Iowa Beekeepers' Association, held at Des Moines, December 4 and 5, 1917. Among the papers presented are the following:

The Present and Future of Beekeeping in the United States, by E. R. Root (pp. 31–33); The Proper Spacing of Frames, by C. P. Dadant (pp. 37–41); A New-Old Method of Wintering, by E. R. Root (pp. 41, 42); Painted *v.* Non-painted Comb Foundation, by J. W. Tinsley (pp. 42–44); Points of Interest in the Anatomy of the Honeybee, by H. E. Ewing (pp. 44–51); Beekeeping in War Times, by E. F. Phillips (pp. 51–56), previously noted from another source (E. S. R., 39, p. 869); The Mechanism which Determines Sex in the Honeybee, by H. R. Werner (pp. 56–65); The Maintenance of Colonies from the Close of the Honey Flow One Year until Its Beginning the Next, by G. S. Demuth (pp. 65–73; Beekeeping in the South, by F. C. Pellett (pp. 74–79); Rearing of Queens, by E. W. Atkins (pp. 79–82).

**Nosema disease**, G. F. White (*U. S. Dept. Agr. Bul. 780 (1919), pp. 59, pls. 4, figs. 7*).—This is a detailed report of investigations conducted by the author extending over a period of several years. The results, which are presented in detail, much of the data being recorded in tabular form, have led to the following summary and conclusions:

"Nosema disease is an infectious disorder of adult bees caused by *Nosema apis*. The disease is not particularly malignant in character, being in this respect more like sacbrood than the foulbroods. Adult workers, drones, and queens are susceptible to infection but the brood is not. The infecting agent *N. apis* is a protozoan that attacks the walls of the stomach and occasionally those of the Malpighian tubules. A colony can be inoculated by feeding it sirup containing the crushed stomachs of infected bees. One-tenth of the germs present in a single stomach are sufficient to produce marked infection in a colony. Within a week following the inoculation the parasite can be found within the walls of the stomach. Before the close of the second week infection can be determined by the gross appearance of the organ. The disease can be produced at any season of the year by feeding inoculations. Infected bees may be found at all seasons of the year, the highest percentage of infection occurring in the spring.

"Nosema infection among bees occurs at least in Australia, Switzerland, Germany, Denmark, England, Canada, and the United States. This distribution shows that the occurrence of the disease is not dependent altogether upon climatic conditions. The course of the disease is not affected directly by the character or quantity of food obtained and used by the bees. A sluggish body of water, if near an apiary and used by bees as a water supply, and the robbing of diseased colonies, must be considered for the present as two probable sources of infection. The transmission of the disease through the medium of flowers is not to be feared. The hands and clothing of the apiarist, the tools used about an apiary, and winds need not be feared as means by which the disease is spread. Hives which have housed infected colonies need not be disinfected, and combs from such colonies are not a likely means for the transmission of the disease. Bees dead of the disease about the apiary are not likely to cause infection unless they serve to contaminate the water supply.

"*N. apis* suspended in water is destroyed by heating for 10 minutes at about 136° F. (58° C.). Suspended in honey, *N. apis* is destroyed by heating at about

138°. *N. apis*, drying at room and outdoor temperatures, respectively, remained virulent for about 2 months, at incubator temperature about 3 weeks, and in a refrigerator about 7.5 months. *N. apis* was destroyed in the presence of fermentative processes in a 20 per cent honey solution in 3 days at incubator temperature and in 9 days at outdoor temperature. In a 10 per cent sugar solution it was destroyed in from 7 to 11 days at room temperature. *N. apis* resisted putrefactive processes for 5 days at incubator temperature, for 2 weeks at room temperature, and for more than 3 weeks at outdoor temperature. *N. apis* when dry was destroyed in from 15 to 32 hours by direct exposure to the sun's rays. *N. apis* suspended in water was destroyed by exposure to the sun's rays in from 37 to 51 hours. *N. apis* if suspended in honey and exposed to the sun's rays frequently will be destroyed on account of the temperature of the honey which results from the exposure. *N. apis* remained virulent in honey for from 2 to 4 months at room temperature. *N. apis* in the bodies of dead bees ceased to be virulent in 1 week at incubator temperature, in 4 weeks at room temperature, in 6 weeks at outdoor temperature, and in 4 months in a refrigerator. *N. apis* in the bodies of dead bees lying on the soil ceased to be virulent in from 44 to 71 days.

"*N. apis* is readily destroyed by carbolic acid, a 1 per cent aqueous solution destroying it in less than 10 minutes. The time element which by the experiments is shown to be sufficient for the destruction of *N. apis* should be increased somewhat to insure their destruction in practical apiculture. The prognosis in Nosema disease varies markedly from excellent, in case of strong colonies with a comparatively small percentage of Nosema-infected bees, to very grave, in case of weak ones with a high percentage of infected bees.

"From a technical point of view the results here given must be considered as being approximately only. They are, however, in most instances sufficient for practical purposes."

**The ants of France and Belgium**, J. Bondroit (*Ann. Soc. Ent. France, 87 (1918), No. 1–2, pp. 1–174, figs. 83*).—A synopsis of the Formicidæ.

**Notes on some genera and species of chalcid flies belonging to the Aphelininæ with description of a new species**, A. B. Gahan (*Proc. U. S. Nat. Mus., 55 (1919), pp. 403–407, figs. 5*).—Attention is called to the fact that the generic name Paraphelinus erected by Perkins is a synonym of Centrodora, Foerster. *Tumidiscapus orthopteræ* reared from the eggs of a locustid deposited in the stems of a grass (*Andropogon glomeratus*) at Titusville, Fla., is described as new.

**Additions and corrections to A List of Families and Subfamilies of Ichneumon Flies of the Superfamily Ichneumonoidea (Hymenoptera)**, H. L. Viereck (*Proc. Biol. Soc. Wash., 32 (1919), p. 48*).—Additions and corrections to the paper previously noted (E. S. R., 40, p. 65).

**A preliminary report on the Trombidiidæ of Minnesota**, C. W. Howard (*Rpt. State Ent. Minn., 17 (1918), pp. 111–144, figs. 93*).—This paper includes keys to adults and nymphs of species found in Minnesota and to the larvæ, and descriptions of five species new to science.

## FOODS—HUMAN NUTRITION.

**Bacteriology and mycology of foods**, F. W. Tanner (*New York: John Wiley & Sons, 1919, pp. VI+592, pls. 9, figs. 88*).—This volume, which is an outgrowth of a course in food microbiology at the University of Illinois, has been developed for those who wish to fit themselves for food control work, for food chemists, and for students in household science possessing a sufficient fundamental training in chemistry. The plan followed has been to present the

methods of analysis along with sufficient discussion on the literature of the subject to show the history and derivation of these methods. Material has been taken freely from the reported investigations and each chapter contains numerous references to the literature on the subject. The subject material is considered under the following heads:

Bacteriological apparatus; media and their preparation; staining technique and microscopic methods; classification and description of bacteria; sterilization and disinfection; proteins, carbohydrates, and fats; yeasts and molds; intestinal bacteria; bacterial examination of air; water hygiene; milk and milk products; bacteriology of eggs; meat and meat products; food preservation; and epidemiology.

The book contains much illustrative material, including eight colored plates on the candled and opened appearance of market eggs.

**The relative digestibility of our food materials,** M. RUBNER (*Berlin. Klin. Wchnschr., 55 (1918), No. 47, pp. 1113–1119*).—The author points out certain features in the estimation of the nutritive value of foods which in his opinion need to be taken into consideration, with consequent revision of values. Among the points discussed are the proportion of protein in different nitrogen-containing substances, the amount of indigestible pentoses and celluloses in carbohydrates, the relative value and digestibility of mixtures of foods of vegetable and animal origin, individual idiosyncrasies, the palatability of foods, and satiety.

**Digestibility of our food,** M. RUBNER (*Umschau, 22 (1918), No. 51, pp. 671–676*).—A résumé of the article noted above.

**Fats and fatty acids as food** (*Jour. Physiol., 52 (1919), No. 5, pp. 328–346*).—Five papers are presented.

I. *Introductory,* W. D. Halliburton and D. N. Paton (pp. 328–330).—A brief outline is given of the purpose of the investigation, which was to determine the possibility during the shortage in the supply of fats of utilizing as human food the fatty acids obtained from fats in the preparation of glycerol for the manufacture of explosives.

II. *Preparations from oils,* J. C. Drummond (pp. 330–333).—An investigation of various sources of fatty acids led to the conclusion that the most suitable for study were those obtained from hardened whale or seal oil, hardened palm or palm-kernel oil, and hardened "soy-cot" oil, the latter a mixture of palm-kernel, soy-bean, and cottonseed oil. An addendum by W. D. Halliburton mentions the impurities which may be present in hardened fats, including nickel and arsenic, both of which under ordinary conditions are present in so small amounts as to be harmless.

III. *Feeding experiments on man,* D. Burns and J. S. Sharpe (pp. 333–339).—Hardened whale oil and the fatty acids obtained from it were used in comparative feeding experiments from which the following conclusions were drawn:

"The fatty acids of hardened whale oil in amounts of 36 gm. per diem, or more than one-third of the usual intake of fat, were as thoroughly digested and absorbed as was the hardened oil from which they were prepared. Their administration for a period of six days caused no disturbance in the absorption of the other constituents of the food as is indicated by the nitrogen and energy balances, nor any other disturbance in health. They may, therefore, be used as a source of fat in the diet of man."

IV. *Feeding experiments on animals,* J. C. Drummond and W. D. Halliburton (pp. 339–343).—The effect of the three fatty acids on maintenance and growth in rats was studied, and the following conclusions were drawn:

"There is no toxic action excited by an admixture of from 5 to 10 per cent fatty acids of the three fats used. The animals on such a diet take their food

readily, grow healthily, and in some cases have produced young while on the diet."

V. *The fat-soluble accessory factor*, J. C. Drummond (pp. 344–346).—Experiments on rats showed that while ordinary whale oil is rich in fat-soluble A, the hardening process involving exposure to hydrogen gas at 250° C. for four hours or more destroys this factor, as does also heating the oil to 100° or more for four hours. In this connection, it is pointed out that margarins made from hydrogenated animal fats are of inferior nutritive value through their lack of the fat-soluble accessory factor.

**Report upon the availability of fatty acids as a source of fat in the diet of man** (*London: Food (War) Committee, Roy. Soc., 1918, pp. 11*).—This is the official report, the details of which are noted above.

**Investigations of the nutritive value of hardened fats**, C. A. Pekelharing and W. Schut (*Pharm. Weekbl., 53 (1916), No. 26, pp. 769–785, figs. 3*).—The nutritive value of certain hardened fats, such as are used in the margarin industries of Holland, was studied by feeding experiments with rats, mice, and dogs.

When all of the fat of the diet consisted of the hardened fat, the rats maintained their body weight but did not grow. The mice grew at the customary rate, and a dog not only increased in weight but assimilated by far the largest part of the fat introduced into the digestive tract.

The results obtained on feeding a mixture of lard and hardened cottonseed oil indicate that the hardened fat can be utilized better if mixed with natural softer fats, as is the case in margarin.

**Report on a dried meat powder**, S. W. Cole (*London: Food (War) Committee, Roy. Soc., 1917, pp. 6, figs. 5*).—The chemical analysis digestibility, and possible utilization of a dried meat powder, said to have been obtained by drying and grinding the lean meat from Argentine cattle, are reported. The protein of the meat had been rendered extremely insoluble by the method of treatment, and appeared to be more resistant to artificial digestion than fresh meat but to be digested and absorbed by the human body almost as readily as beefsteak. Feeding experiments with rats showed that the powder contained a good supply of accessory food factors.

It is suggested that such a product, while not particularly appetizing when eaten alone, could be used successfully in soups, croquettes, and sausages.

**The [Jerusalem] artichoke as a source of carbohydrate**, F. G. Hopkins (*London: Food (War) Committee, Roy. Soc., 1918, pp. 2*).—As the result of digestion experiments in which the relative utilization of diets furnishing 3,000 calories and containing, respectively, 1 lb. of potatoes and 1 lb. of Jerusalem artichokes was determined, the conclusion is drawn that while artichokes are probably less well utilized than potatoes they can, when eaten in reasonable quantities, replace potatoes or similar carbohydrate material in a satisfactory manner.

**The influence of the percentage extraction and of admixture upon yeast activity**, D. J. Lloyd (*London: Food (War) Committee, Roy. Soc., 1918, pp. 2*).—The admixture of foreign flours with wheat was found not to decrease yeast activity, although the addition of corn or barley to wheat flour slightly decreased the maximum expansion of the dough.

**Food Surveys** (*U. S. Dept. Agr., Food Surveys, 2 (1919), No. 27, pp. 8+4*).—This number, which is announced as the final issue, reports data as to commercial stocks of grain, flour, and miscellaneous food products in the United States on June 1, 1919. An index to Volumes I and II is included.

**Report on the food requirements of man and their variations according to age, sex, size, and occupation** (*London: Food (War) Committee, Roy. Soc.,*

*1919, pp. 19, figs. 3*).—This report of the Food (War) Committee of the Royal Society is a summary of modern conceptions of the food requirements of man under different conditions.

**The quantity of fat-soluble vitamins in coconut oil**, B. C. P. JANSEN (*Meded. Geneesk. Lab. Weltevreden [Dutch East Indies], 3. Ser. A, pt. 1–2 (1918), pp. 78–94, pl. 1*).—A study of the fat-soluble vitamin content of coconut oil was made by means of growth experiments with wild house rats, fed upon a basal diet of polished rice and the water-soluble extract from rice bran, with the addition of equivalent amounts, respectively, of cold-pressed coconut oil, olive oil, and ether extract of egg yolk. While growth was satisfactory on the diet containing the ether extract of egg yolk, addition of olive or coconut oil had no growth-promoting influence, indicating that coconut oil, like olive oil, is lacking in the fat-soluble vitamin.

The author points out a possible connection between the small stature of the natives of the Dutch Indies and the use during so many generations of a diet poor in vitamins.

**A study of the physiology of endogenous uric acid**, H. F. HÖST (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 17–31, figs. 4*).—This report deals with the determination of uric acid in the urine and blood in 17 subjects, 2 of whom were normal while the remainder were convalescents and patients who had never had symptoms of gout. The nitrogen output was determined in all cases and the H-ion concentration in four. The experiments are reported in detail for the two normal subjects only, but conclusions are drawn on the basis of the results obtained with all subjects.

In none of the 17 subjects was the uric acid output for 24 hours constant. With a fixed diet and under similar conditions the output was in most cases extremely irregular, showing daily variations up to 80 per cent. Even in individuals whose output of uric acid was most regular the output was found to be dependent on several factors, of which variations in the diet were the most important. Beyond a certain minimum a change in the caloric value of the food produced a change in the same direction in the uric acid output, the change, however, being greater when the amount of calories was varied by means of protein than by nitrogen-free foods. With a constant caloric value, the uric acid output depended to a certain extent on the food protein. The excretion of nitrogen and the H-ion concentration of the urine were without influence, but an increase of body temperature was accompanied by a considerable increase in the uric acid output.

The endogenous uric acid output in 24 hours varied between 0.27 and 0.99 gm. The endogenous uric acid in the blood varied from less than 0.5 to 2.68 gm. per 100 cc. of blood, but was in the case of each individual constant within the limits of error of the method (10 per cent).

The author states that definite conclusions regarding synthetic uric acid formation can not be drawn from these experiments, but that the results indicate that a not inconsiderable part of the endogenous uric acid comes from metabolism in the tissues of the digestive glands.

**Respiratory metabolism investigations on the question of the formation of sugar from proteins and their degradation products**, J. M. DE CORRAL (*Biochem. Ztschr., 86 (1918), No. 3–4, pp. 176–222; abs. in Chem. Abs., 12 (1918), No. 22, p. 2353*).—The liver of a dog was rendered free from glycogen by the administration of peptone, after which the capacity for glycogen formation from fats and proteins was determined by measurement of the respiratory quotient with the Jaquet apparatus (E. S. R., 16, p. 287).

The capacity for forming glycogen from carbohydrates after administration of peptone was found to be somewhat diminished but still to exist. On adminis-

tering fats exclusively after two days' treatment with peptone the respiratory quotient in a following period of starvation was the same as that after peptone, but on administering amino acids or proteins the resulting respiratory quotient indicated combustion of carbohydrates, showing that carbohydrates can be formed from proteins. Such a formation is thought to take place, however, only when carbohydrates are lacking in the organism.

**Observation on hyperglycemia and glycosuria**, H. J. HAMBURGER (*Brit. Med. Jour., No. 3036 (1919), pp. 267–271*).—From perfusion experiments with isolated frog kidneys, the author concludes that the glomerular membrane of the kidney has the power of retaining free glucose. This power appears to be governed by the influence of the chemical composition of the perfusion liquid upon the glomerular epithelium, a definite relation between Ca and K ions being necessary.

This is thought to render needless the conception of a colloidal sugar compound (the "sucre virtuel" of Lépine). The rentention of glucose is considered to be due rather to the structure or configuration of the molecule. If there is hyperglycemia of a certain degree the glomerular epithelium weakens and allows glucose to pass through, causing a state of glycosuria.

**The splitting of neutral salts in contact with colloids with the formation of acids and bases**, A. SCALA (*Ann. Ig. [Rome], 28 (1918), No. 11, pp. 605–619*).—Animal gelatin, agar, siliceous gelatin, and muscular flesh were allowed to stand with distilled water for 12 hours, the water drained off and titrated for acidity, and the process repeated until the wash water was neutral. The same process was repeated after the addition of from 0.5 to 1 gm. of various salts to the neutral colloidal material.

Sodium chlorid and sulphate were found to form with animal and vegetable colloids complexes which on hydrolysis formed acids, while the complexes with disodium phosphate tended to form alkalis. It is pointed out that these states in normal physiological conditions tend to compensate each other, but that in pathological conditions one or the other may predominate. The author attributes diabetes to excess of alkali and pellagra to excess of acid.

**The diagnosis of acidosis**, J. J. R. MACLEOD (*Jour. Lab. and Clin. Med., 4 (1919), No. 6, pp. 315–329*).—This is a review and criticism of the methods at present in use for diagnosing acidosis, with many references to the literature on the subject.

**A further demonstration of the part played by accessory food factors in the etiology of rickets**, E. MELLANBY (*Jour. Physiol., 52 (1919), No. 5, pp. LIII, LIV*).—This is a brief report of feeding experiments with puppies to show the part played by diet in producing and preventing rickets. The standard diet, which is said to produce rickets within six weeks, consisted of separated milk (175 to 350 cc.), 70 per cent wheat bread ad libitum, linseed oil (5 to 10 cc.), yeast (5 to 10 gm.), orange or lemon juice 3 cc., and sodium chlorid 2 gm. The effect of various additions to this diet was as follows:

Lean meat (10 gm. a day) delayed but did not prevent rickets, the extent of the delay depending on the initial weight and rate of growth of the animal. An increase in the separated milk to 350 or 400 cc. did not prevent rickets, thus excluding the possibility that the calcium intake was deficient. The addition of 10 gm. of butter or cod liver oil completely prevented rickets, but the substitution of 10 gm. of cottonseed oil, olive oil, or babassu oil for the linseed oil of the basal diet did not prevent the disease.

All vegetable oils were not equally ineffective in preventing rickets. The oils tested in order of increasing merit were linseed, babassu, cottonseed, peanut, and olive. A hydrogenated fat tested was similar to linseed oil. Suet and lard appeared to be effective if a small amount of meat was also eaten.

It is pointed out that the results are for the most part in keeping with the idea that rickets is a disease primarily due to a deficiency of fat-soluble A, and that substances containing and associated with fat-soluble A appear to be particularly concerned in the calcification processes of bones and teeth.

**An experimental investigation on rickets**, E. Mellanby (*Lancet [London], 1919, I, No. 11, pp. 407–412*).—The first of two lectures on rickets delivered at the Royal College of Surgeons of England reports in detail the results of the investigations noted above.

The second lecture consists of a general discussion of rickets as a deficiency disease. Three difficulties in considering the antirachitic factor and fat-soluble A as identical are the relation of rapidity of growth to the development of rickets, the action of meat and meat extracts, and the different effects of vegetable oils. The fact that large and rapidly growing puppies require more of the antirachitic factor is thought not to be out of keeping with the supposition that fat-soluble A and the antirachitic factor are identical if it is considered that the function of fat-soluble A in the diet is not so much to insure growth as to promote correct growth, in which case the greater the amount of growth in any period the greater will be the amount of fat-soluble A necessary to keep it along normal lines. The favorable effect of meat and meat extracts is thought to be due to their specific dynamic or stimulating action. The varying effects of vegetable oils, which have hitherto been considered to be quite lacking in fat-soluble A, may be explained on the supposition that previous work involving the growth of rats has not furnished a sufficiently delicate test for fat-soluble A. The author is of the opinion that the antirachitic factor and fat-soluble A are identical, or at least that the distribution of the two substances is remarkably similar. Some eariler hypotheses as to the etiology of the disease are cited in confirmation of this theory.

In conclusion, the author states that the diet of an infant should include a maximum amount of the antirachitic factor. He points out in this connection that care should be taken not to include too much of foodstuffs such as bread, vegetable oils, proprietary articles, etc., which are lacking in the antirachitic factor, as the more of such foodstuffs is eaten the greater is the necessity for foods containing this factor. While emphasizing the importance of milk as an antirachitic factor, attention is called to the probability that the cow fed in the stall largely on vegetable oil cake will give a milk deficient in accessory food factors and that if a nursing mother's diet is deficient in the antirachitic factor the breast-fed child may develop rickets.

**The cause and prevention of scurvy** (*London: Food (War) Committee, Roy. Soc., 1918, pp. 2*).—This is a summary of conclusions, drawn chiefly from investigations at the Lister Institute which have been previously noted from other sources, as to the cause and prevention of scurvy. It is particularly emphasized that in cooking the destruction of antiscorbutic properties depends rather upon the time than the temperature employed.

**Trench feet a deficiency disease**, L. Bruntz and L. Spillman (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 1, pp. 8–10*).—The authors attempt to prove that trench feet, a disease characterized by polyneuritis of the extremities, is caused primarily by a lack of vitamin in the diet, the conditions of trench life serving to accentuate the primary neuritic condition.

**Note on the influence of the rate of cooling on metabolism**, L. Hill (*London: Food (War) Committee, Roy. Soc., 1918, pp. 5, figs. 2*).—The author maintains that in most calorimeter experiments sufficient attention has not been given to the cooling power of moving air, and presents data from various sources illustrating the effect of wind upon metabolism. Data are given showing an increase of from 37 to 65 calories per square meter of surface in the

resting metabolism of a young woman exposed to inclement cold winds. A calculation of the cooling power on the surface of the cheek as determined by the Kata-thermometer gave results from six to seven times that of the loss of body heat, showing that under the conditions of cool moving air the resting metabolism is apparently controlled by the surface temperature of the cheek and can be calculated by taking the record of the dry Kata-thermometer cooling power and cheek surface temperature.

## ANIMAL PRODUCTION.

**The American Society of Animal Production.—Record of proceedings of annual meetings, December, 1915, and December, 1916** (*Amer. Soc. Anim. Prod. Procs. 1915–16, pp. 270, figs. 30*).—This is a combined report published December, 1917, of the meetings held, respectively, at Manhattan, Kans., and Urbana, Ill. Some 27 papers reporting or discussing research are printed, together with a report on Methods of Experimentation in Animal Nutrition (pp. 101–111) by a committee composed of H. S. Grindley, W. A. Cochel, J. M. Evvard, L. D. Hall, and W. A. Carroll.

**The average correlation within subgroups of a population,** S. Wright (*Jour. Wash. Acad. Sci., 7 (1917), No. 17, pp. 532–537*).—The "populations" used in breeding experiments and similar investigations are frequently composed of several fairly well differentiated groups, such as families or even breeds. A measure of correlation of two characters in the entire population, disregarding as far as possible the group differences, is often desired but, as the author points out, the ordinary coefficient of correlation does not meet the requirements because its magnitude is influenced by heterogeneity in the material, which, moreover, can seldom be considered "normal." The average of the coefficients of correlations of the individual groups is suggested as a good approximation to the desired measure. If the separate group correlations are not needed for the purpose of the experiment or their determination would be statistically worthless on account of the small size of the group, the straightforward computation of this average involves some very laborious numerical work not otherwise utilized. Formulas developed in this paper indicate how the average group correlations can be computed from a knowledge of the correlation and standard deviations of the two characters in (1) the total population, and (2) the means of the groups. In many cases all these statistical constants will have a value in connection with an investigation apart from this use.

**Further illustrations of the applicability of a coefficient measuring the correlation between a variable and the deviation of a dependent variable from its probable value,** J. A. Harris (*Genetics, 3 (1918), No. 4, pp. 328–352, figs. 6*).—In a previous paper[1] the author pointed out that in studying the interrelations of two variables in which one is a fraction of the other (such as the number of fertile eggs laid by a hen and the percentage hatched) the ordinary coefficient of correlation does not provide as much useful information as a coefficient showing whether the value of the fraction becomes relatively larger or smaller with increasing values of the independent variable. The formulas derived in the earlier paper are repeated in a form convenient for computation and supplementary ones added. A number of illustrations of the use of the coefficient, both with plant and animal material, are given, including problems of fertility and fecundity, the proportionality of parts, the relationship between chemical data such as total solids and a particular solid constituent, and the measurement of differential viability of zygotic types in a breeding experiment.

[1] Biometrika, 6 (1909), No. 4, pp. 438–443.

**The modified Wolff-Lehmann feeding standards**, F. B. MORRISON (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 64–69*).—After a discussion of the limitations of feeding standards and the necessity of modifying the Wolff-Lehmann standards, suggested modifications are presented which have since been embodied in Table V of the appendix to Henry and Morrison's Feeds and Feeding (E. S. R., 34, p. 261).

**Nitrogenous constituents of feeding stuffs**, H. S. GRINDLEY (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 133–141*).—The analytical data on the amino-acid content of blood meal, tankage, skim milk, wheat, barley, oats, corn, white soy beans, cottonseed meal, and alfalfa hay published by Grindley and Slater (E. S. R., 34, p. 412) are reprinted, and a general discussion is given as to the value of such determinations in feeding investigations.

**Concerning corn as a source of protein and ash for growing animals**, A. G. HOGAN (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 227–232*).—This contribution from the Kansas Experiment Station presents without essential modifications the material in a publication by the author previously noted (E. S. R., 37, p. 164), with an added section reporting the observation that a pair of rats kept on a ration of corn and ash consistently ate their young (5 litters) until the diet was changed. Parturition was difficult during the corn-feeding period.

**Utilization of apple pomace for animal feeding**, G. WARCOLLIER and HÉDIARD (*Vie Agr. et Rurale, 8 (1918), No. 1, pp. 11, 12*).—Suggestions are given for the use in animal feeding of fresh, ensiled, and dried pomace. Proximate analyses of four samples of the latter are published.

**[Analyses of] unusual feeding stuffs**, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1917, pp. 477, 478*).—Proximate analyses are given of samples of *Yucca elata*, sword beans (*Canavalia ensiformis*), alfalfa hay, alfalfa straw, tepary-bean hay, sorghum refuse, milo maize head chop, and wheat bran. The protein content of other samples of wheat bran, of shallu whole grain, and of cotton-stalk hurds is also noted.

**Weights of typical Shorthorns**, J. L. TORMEY (*Breeder's Gaz., 75 (1919), No. 24, pp. 1408, 1410*).—A table is presented showing the average weights and the range in weights by age groups of breeding animals of the Shorthorn breed exhibited at the International Live Stock Expositions of 1908 and 1910.

**Investigations with growing steers**, T. L. HAECKER (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 169–173*).—In continuation of work at the Minnesota Experiment Station previously mentioned (E. S. R., 32, p. 99) and published elsewhere,[1] the author reports the individual slaughtering data of 5 calves killed at the weight of 100 lbs. and 5 killed at 400 lbs., together with the average for each group of the water, protein, fat, and ash content of the several tissue components of the carcasses.

**More grass to make more beef**, F. D. FARRELL (*Breeder's Gaz., 75 (1919), No. 15, pp. 841, 842*).—A consideration of some of the problems of grassland management, with particular reference to the native pastures of Kansas.

**The utilization of grain sorghums in meat production**, W. A. COCHEL (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 9–14*).—The following feeding trials at the Kansas Experiment Station are summarized: (1) Experiments in wintering beef calves and cows on Kafir corn silage or fodder with a protein supplement, reported in Bulletin 198 (E. S. R., 32, p. 68); (2) a comparison, apparently not elsewhere published, of ground corn, ground Kafir corn and hominy feed for fattening steers, with sweet sorghum silage as roughage; and (3) the hog-feeding tests given in the report of the station for 1915 (E. S. R., 36, p. 167).

[1] Amer. Soc. Anim. Prod. Proc. 1914, pp. 18–25, figs. 2.

The grain sorghums are considered the best feeding stuffs available for the dry-land farmer.

[Velvet beans for] beef cattle, G. S. Templeton (*Alabama Col. Sta. Circ. 49 (1919), pp. 24, 25*).—A cooperative experiment is reported comparing three methods of preparing velvet beans for steer feeding. Four lots of 15 steers each were fed 117 days beginning December 15, 1917. One lot was given cottonseed meal as a check. Sorghum silage was the only roughage fed.

It is computed that 3.07 lbs. of the beans fed dry in the pod, 2.7 lbs. fed in the pod but soaked in water, and 2.16 lbs. of the beans and pods ground into a meal were each equal in feeding value to a pound of cottonseed meal. The charge for grinding the beans was $4.50 per ton, but this operation increased the profit per head $15.65 over the lot fed the dry beans and $8.60 over the lot fed the soaked beans.

**Silage as a factor in beef production.** W. H. Tomhave (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 158–164*).—The author summarizes a series of experiments at the Pennsylvania Experiment Station (E. S. R., 24, p. 269; 30, p. 372; 37, p. 365), in which various amounts of silage were fed to steers, and gives a brief account of changes in methods of cattle feeding since 1905 leading to a more widespread use of silage.

**Silage for range cattle.** R. H. Williams and W. S. Cunningham (*Arizona Sta. Rpt. 1917, pp. 469, 470*).—Practical tests at the Cochise and Prescott Dry Farms are cited to show that corn and grain sorghum silages are suitable feeds to tide cattle over periods of range shortage. "Since there are large areas in dry farming and overflow districts suitable for growing crops for silage, these experiments suggest that stockmen should put forth every possible effort to secure good land and raise crops which may be fed the animals during short range."

**Tests of the work oxen of Morocco at the Moroccan agricultural exhibition at Casablanca (October, 1918).** A. Leroy (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 35, pp. 965–969*).—The author publishes a table showing for each of 14 oxen and 2 zebu crosses the age, the body weight, the height at the withers, the maximum force exerted on a dynamometric spring, the maximum velocity attained without load, and the power available for sustained muscular work. The last-named determination is assumed equal to 8.25 per cent of the product of the two preceding, following the practice of Ringelman (E. S. R., 20, p. 70), whose methods were used throughout.

**Forage crops for lambs.** L. J. Horlacher (*Breeder's Gaz., 75 (1919), No. 26, pp. 1508, 1510*).—An experiment at the Kentucky Experiment Station comparing rape and blue grass as forage crops for lambs is reported. The lambs were allowed to suckle the ewes night and morning, ran on pasture during the day, and received from 0.5 to 0.75 lb. of grain (oats and bran, 2:1) per head daily. The test lasted 42 days commencing June 20, 1918.

The lot of 10 lambs with access to an acre of blue grass (not previously pastured) had an average initial weight of 62.3 lbs., made a daily gain per head of 0.3 lb. and consumed 2.2 lbs. of grain per pound of gain. The lot of 10 lambs with access to an acre of Dwarf Essex rape had an average initial weight of 59.4 lbs., gained at the rate of 0.38 lb. per head per day, required only 1.8 lbs. of grain to make a pound of gain, and were in better market condition at the end than the other lot.

"During the first two weeks the lambs scarcely touched the rape at all, with the result that the lambs on blue grass pasture made practically double the gains of those on rape. . . . By the middle of July the pastures were getting very dry. The blue grass was still good, but it was getting short and brown. The rape was turning brown and yellow. At the end of four weeks

the lambs on rape had regained all they lost at the beginning and were forging ahead. . . . During the fifth week of the test continuous rains fell; the pastures freshened up greatly and the difference in favor of rape was not so marked as it would have been under normal summer conditions."

There were no cases of bloat.

**Influence of strictly vegetable diets on growth and reproduction of swine**, E. B. HART and E. V. MCCOLLUM (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 49–53, figs. 4*).—This paper gives the details of an investigation previously noted (E. S. R., 35, p. 563). Microphotographs are reproduced of sections of the spinal cord of a normal and of a grain-fed pig. The spinal cord of the latter showed a marked edematous condition with the motor cells noticeably constricted.

**Alfalfa pasture for hogs**, R. H. WILLIAMS and W. S. CUNNINGHAM (*Arizona Sta. Rpt. 1917, pp. 466, 467*).—Two lots of five Duroc-Jersey pigs were fed a daily ration of from 2 to 3 lbs. of rolled barley and 6 lbs. of skim milk per 100 lbs. live weights, for 12 weeks. One lot had access to a small alfalfa pasture and gained 433 lbs. during the period. The other received no forage and gained 373 lbs. The former lot consumed 80.5 lbs. more barley and 108 lbs. more milk and showed much more finish.

Another test with two pigs on alfalfa pasture without other feed is cited, in which the respective gains were only 6 and 7 lbs. during 8 weeks, while litter mates fed grain and pasture gained 40 lbs. each.

**[Dry lot finishing of hogs following peanut pasture]**, G. S. TEMPLETON (*Alabama Col. Sta. Circ. 40 (1919), p. 26*).—Seventy hogs were grazed for 8 weeks on peanut pasture. They were then divided into two lots, one of 40 head being continued on peanut pasture for another period of 6 weeks, and a second of 30 head being fed in a dry lot on corn and tankage in a self-feeder. At the close of the 6 weeks' period they were marketed. The lot fed 14 weeks on peanuts were classified by the packer's expert as oily, and sold for 15 cts. per pound. Those finished in the dry lot were classified as medium soft and sold for 15.5 cts.

**Cottonseed meal as a feed for hogs**, J. C. BURNS (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 15–20*).—A 96-day feeding experiment during the winter of 1914–15 at the Texas Experiment Station is reported, in which cottonseed meal was used as a supplement to milo maize chop in fattening 110-lb. hogs.

It was found that untreated cottonseed meal in amounts sufficient to balance the ration (1 part in 7) gave results equal to fermented cottonseed meal (1 part in 7, and 1 part in 4) previously found satisfactory (E. S. R., 18, p. 667), and to unfermented meal (1 part in 4) treated with ferrous sulphate solution as recommended by the North Carolina Experiment Station (E. S. R., 31, p. 578). The average daily gains per head varied from 1.24 to 1.26 lbs. in the different cottonseed meal lots, while in the check lot which received no supplement it was only 0.65 lb. There were no fatalities, but the lot fed the heavy ration of fermented cottonseed did not eat well toward the end.

It is pointed out that cottonseed meal is ordinarily one of the cheapest sources of protein at the command of the southern hog raiser, and its use should not be abandoned because heavy or prolonged feeding is injurious. "It would not be advisable to feed more than one-half pound of meal per 100 lbs. of live weight per day to any class of hogs for a very long period, and if continuous meal feeding is practiced it would be well not to feed over 0.35 lb., or 10 per cent of the whole ration when hogs are on full feed."

**Southern pork production**, P. V. EWING (*New York: Orange Judd Co., 1918, pp. X+285, figs. 57*).—The topics customarily found in manuals of swine hus-

bandry are discussed in this volume, including breeds, judging and fitting for the show ring, diseases, and the utilization of pork and pork products. In the sections on feeding, management, and marketing, and in the introductory discussion of economic aspects, the problems and practices peculiar to the Southern States are given particular attention and are contrasted with corn belt conditions.

**Horse management**, R. W. CLARK (*Colo. Agr. Col., Ext. Serv. Bul., 1. ser., No. 150–A (1918), pp. 32, figs. 14*).—Information is assembled concerning draft horses, particularly with reference to the selection of stallions and the care of colts.

**Poultry feeds and feeding**, G. ROBERTSON (*Canada Expt. Farms, Bul. 91 (1918), pp. 31, figs. 13*).—This manual deals with the feeding of domestic fowl, turkeys, ducks, and geese. A paragraph is devoted to each of the common poultry feeds, and a compilation of the chemical composition and digestibility of various feeding stuffs is tabulated. Designs for hoppers and feeding troughs are included.

**Outline of object and plan of the Nebraska national egg-laying contest** (*Nebraska Sta. Circ. 7 (1919), pp. 4*).—This is an announcement of a 5-year egg-laying and breeding contest beginning November 1, 1919.

**Final report on the fourth poultry egg-laying trials, 1915–16** (*Poultry Competition Mo. [Harper Adams Agr. Col.], 1 (1915–16), No. 10, pp. 1–32, pl. 1, figs. 3*).—In a continuation of reports previously noted (E. S. R., 33, p. 572; 38, p. 72), of the egg-laying contests held at Newport, Shropshire, by the Harper Adams Agricultural College, this article gives a final summary of the fourth 1-year contest and a report of the first year of a 2-year contest. Records of separate pens by 4-week periods, and the total record of each individual entrant are published. The 4-week records of individuals are to be found in the preceding numbers of this periodical, which is almost exclusively devoted to statistical matter connected with the competitions.

A study of the relations of winter production to the year's record based on the data accumulated is included.

**[Report of the fifth poultry egg-laying trials 1916–17]** (*Poultry Competition Mo. [Harper Adams Agr. Col.], 2 (1916–17), No. 12, pp. 3–23*).—This is a less complete report than the preceding, giving the second year's records by pens of the 2-year contest and the year's records of individual pullets. The records by periods of four weeks are published in the other numbers of the volume.

**Sixth poultry egg-laying competition extending over twelve months, 1917–18** (*Utility Poultry Jour. [Harper Adams Agr. Col.], 3 (1917–18), No. 12, pp. 1–28, pls. 2, fig. 1*).—A report similar to the above of the sixth contest at the Harper Adams College. As before, the individual records by 4-weeks periods are published in the earlier numbers of this volume.

The following body measurements are recorded for about 160 birds, classified according to egg record: (1) The base of the neck to the oil gland, (2) the breadth of the back, "taken between the inside of the fingers when spanning between the depressions on the hips," (3) the length of the keel, (4) the distance from the hind end of the keel to the pelvic bones, (5) the distance between the pelvic bones, and (6) the girth of the position of measurement 2, with the legs directed backward. Measurement 4 is held to be most indicative of laying capacity.

**Egg-laying tests at Hawkesbury Agricultural College, sixteenth year's results, 1917–18**, E. F. WHITBREAD and J. HADLINGTON (*Agr. Gaz. N. S. Wales, 29 (1918), No. 5, pp. 348–369, figs. 8; also in Dept. Agr. N. S. Wales Farmer's*

*Bul. 118 (1918), pp. 24, figs. 8*).—This is a discussion of the New South Wales contest concluded March 31, 1918. Monthly individual egg records are tabulated of 420 pullets and 120 second-year hens. The production of the latter as pullets is also given. The report of the previous contest has been noted (E. S. R., 38, p. 72).

[Reports on the fifth, sixth, and seventh Victorian egg-laying competitions, 1915–16 and 1917–18], A. HART (*Jour. Dept. Agr. Victoria, 14 (1916), No. 6, pp. 329–340, figs. 8; 15 (1917), No. 6, pp. 321–332, figs. 7; 16 (1918), No. 6, pp. 321–338, figs. 8*).—Continuing previous summaries (E. S. R., 33, p. 673) these reports discuss the results of the egg-laying contests held annually at Burnley, Victoria, beginning April 15. The seventh contest was closed after 11 months, while the others continued a full year. Tables give the monthly egg records for each pen of six birds and the breed averages. Individual records of 136 pullets by months are tabulated in the seventh report.

Report of an investigation as to cause of death of chicks in shell in artificial incubation, H. B. ARBUCKLE (*Jour. Elisha Mitchell Sci. Soc., 34 (1918), No. 3, pp. 141–145, pl. 1*).—The author states that under the standard conditions of artificial incubation generally considered essential for a good hatch most deaths in the shell occur after the eighteenth day. The oxygen content of the incubator air at this stage was found to be reduced. The percentage of fertile eggs hatched was increased by introducing a current of oxygen into the incubator during the last few days of incubation.

## DAIRY FARMING—DAIRYING.

Alfalfa as a sole feed for dairy cattle, F. W. WOLL (*Jour. Dairy Sci., 1 (1918), No. 6, pp. 447–461*).—Lactation and other records are reported of 6 heifers of the California Experiment Station herd put on an exclusive ration of alfalfa hay (following methods used by dairymen in western irrigated districts) several months before freshening and continued on alfalfa for upward of 3 years. Similar records are presented for comparison of 6 heifers of like age and breeding fed a mixed ration of alfalfa hay, silage, and various concentrates (mainly rolled barley, dried beet pulp, coconut meal, and wheat bran). Records of 6 first lactations and 3 second lactations are available in each group.

During the first lactation the alfalfa-fed heifers averaged 5,743 lbs. of milk and 204.2 lbs. of butter fat, while the group on mixed rations produced 7,359 lbs. of milk and 297.1 lbs. of fat. The milk records of the second lactation averaged 6,372 and 7,420 lbs. and the butter-fat records 285.8 and 351.5 lbs., respectively. Under average California market prices from 1910 to 1916 the mixed ration cost about 50 per cent more than the alfalfa ration.

Six body dimensions of the heifers were measured, and the averages and the average increases of each lot are presented. "While the evidence can not be considered conclusive, the tendency is toward a slightly larger body development of the animals on the mixed rations than of those on alfalfa only."

The relation of alfalfa feeding to abortion is discussed, but the small amount of new data is not thought to require modification of conclusions previously noted from the same station (E. S. R., 34, p. 269).

Alfalfa hay v. alfalfa hay and silage for dairy cows, R. H. WILLIAMS and W. S. CUNNINGHAM (*Arizona Sta. Rpt. 1917, pp. 468, 469*).—Two lots comprising 4 and 3 cows, respectively, were fed alternately by the reversal method during two 3-week periods on the following rations: (1) Alfalfa hay 20 lbs., corn silage 35 lbs., and (2) alfalfa hay 30 lbs. The average daily yields during

the feeding of the first ration were 24.27 lbs. of milk and 0.881 lb. of butter fat; during the feeding of the second ration 24.72 lbs. of milk and 0.846 lb. of butter fat. The two rations are thus considered of equal feeding value, and it is pointed out that with alfalfa hay at $20 and corn silage at $6 per ton each costs about the same.

It is stated that Arizona dairymen are beginning to make more extensive use of silage.

**The mineral metabolism of the milch cow [I, II, III].** E. B. Forbes (*Amer. Soc. Anim. Prod. Proc. 1915, pp. 1–8; 1916, pp. 117–125; Jour. Dairy Sci., 2 (1919), No. 1, pp. 9–18*).—These three papers are extensive extracts from the three bulletins of the same title issued by the Ohio Station (E. S. R., 40, p. 373).

**Fifth annual report of the International Association of Dairy and Milk Inspectors.** I. C. Weld (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 5 (1916), pp. 319, pls. 2, figs. 3*).—Besides a number of papers read at the annual convention at Springfield, Mass., in October, 1916, this publication contains the following committee reports: On dairy-farm inspection, by C. B. Lane, J. A. Gamble, and H. A. Harding (pp. 45–53); on city milk-plant inspection, by H. E. Bowman, F. H. Bothell, and W. P. Palmer (pp. 54–59); on legislation and legal limits for the control of milk and cream, by J. S. Abbott, J. O. Jordan, and G. B. Taylor, with the assistance of H. S. Bailey (pp. 60–70); and on methods of appointment of dairy and milk inspectors and their compensation, by E. Kelly, W. S. Gimper, and G. S. Hine (pp. 181–188), previously noted from another source (E. S. R., 36, p. 774).

The Report of the Committee on Statistics of Milk and Cream Regulations of the Official Dairy Instructors' Association, by I. C. Weld, E. H. Farrington, J. A. Gamble, H. E. Ross, and R. C. Potts, of which an extract has been noted (E. S. R., 36, p. 874) and which was read by request before the convention, is also printed (pp. 71–125).

The following papers have been noted from other sources or are based upon discussions previously noted: Relation of the Fat in Milk to the Solids-not-fat, by L. P. Brown and C. V. Ekroth (pp. 126–133) (E. S. R., 37, p. 113); Chemical Quality of New York City Milk, by the same authors (pp. 134–140) (E. S. R., 37, p. 175); The Sterilization of Dairy Utensils on the Farm and a Demonstration of a New Steam Sterilizer, by G. B. Taylor (pp. 200–206) (E. S. R., 35, p. 677; 36, p. 663); and The Reliability and Significance of the Bacteriological Analysis of Milk, by H. W. Conn (pp. 207–227) (E. S. R., 36, p. 775).

**Sixth annual report of the International Association of Dairy and Milk Inspectors.** I. C. Weld (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 6 (1917), pp. 232*).—The papers read at the annual convention held in Washington, D. C., in October, 1917, are printed, as well as the reports of committees, including the following: On dairy-farm inspection, by J. A. Gamble (pp. 40–47); on methods of bacterial analyses of milk and milk products and the interpretation of results, by G. E. Bolling (pp. 85–88); on rules and regulations necessary for securing a clean and safe milk supply, by E. Kelly (pp. 106–111), also published elsewhere:[1] and on the care of milk in transportation, by J. O. Jordan (pp. 114–121).

**Seventh annual report of the International Association of Dairy and Milk Inspectors.** I. C. Weld (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 7 (1918), pp. 239*).—This publication covers the proceedings of the convention at Chicago, in December, 1918. Among the committee reports presented are the following: On cost of dairy and milk inspection, by H. Lloyd (pp. 42–47); on

[1] Jour. Dairy Sci., 1 (1917), No. 4, pp. 356–360.

legislation affecting milk and milk products, by J. O. Jordan (pp. 71–73); on methods of bacterial analyses of milk and milk products and the interpretation of results, by G. B. Taylor (pp. 115–117); and on organization of milk control, by W. H. Price (pp. 214–223).

A number of papers are also printed.

**Machine v. hand milking**, F. T. Riddell (*Michigan Sta. Quart. Bul., 1 (1919), No. 4, pp. 163, 164*).—The following is a summary of data assembled from 93 farms in the condensery districts of Michigan as to the comparative labor cost of machine and hand milking:

*Labor used in machine and in hand milking.*

| Methods of milking and herd sizes included. | Number of herds. | Cows per herd. | Labor per cow per year. | | | Labor per 100 lbs. of milk. | | |
|---|---|---|---|---|---|---|---|---|
| | | | Milking. | Care of milk and utensils. | Total. | Milking. | Care of milk and utensils. | Total. |
| | | | *Hours.* | *Hours.* | *Hours.* | *Hours.* | *Hours.* | *Hours.* |
| Machine—all herds | 51 | 18.2 | 57.9 | 13.4 | 71.3 | 0.91 | 0.21 | 1.12 |
| Machine—15 or fewer cows | 17 | 13.1 | 65.2 | 14.7 | 79.9 | .99 | .22 | 1.21 |
| Machine—more than 15 cows | 34 | 20.8 | 55.6 | 13.0 | 68.6 | .88 | .21 | 1.09 |
| Hand—all herds | 42 | 13.6 | 89.2 | 11.2 | 100.4 | 1.26 | .16 | 1.42 |

"Less difference would probably be found where market milk was being produced, as the higher requirements specified for milk used for such purposes would necessitate greater attention to the care and cleaning of the milk machines."

**Safe milk for the small town**, K. E. Miller (*Pub. Health Rpts. [U. S.], 33 (1918), No. 50, pp. 2213–2217*).—The plans of Tarboro, N. C., to maintain a municipal pasteurizer and to distribute all the milk (about 400 qt. a day) sold in the town are outlined. A note added to the paper states that the pasteurizing plant was placed in operation October 1, 1918. The town will refuse to buy milk not produced under satisfactory sanitary conditions.

The text of the ordinance authorizing the town to engage in the milk business is appended.

**Questions concerning the control of a city milk supply answered**, R. S. Breed (*New York State Sta. Bul. 456 (1918), pp. 3–10*).—Information concerning the milk supply of Geneva, N. Y., is furnished by the answers to a series of 18 questions. The topics include the measures taken to guard against sophistication and contamination, prices and the basis of payment, pasteurization, and the efficiency of inspection. Through a cooperative arrangement members of the station staff exercise supervision over the milk supply of the city.

**Observations on the washing of milk cans**, R. O. Webster (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 6 (1917), pp. 54–66; also in Jour. Dairy Sci., 2 (1919), No. 1, pp. 50–59*).—This paper presents a portion of the data collected by the Bureau of Chemistry of the U. S. Department of Agriculture in the course of an investigation under the Food and Drugs Act of the milk supply of a large middle western city. The methods and equipment used by 32 dealers in washing cans are noted. Eight washed by pouring washing solutions from one can to the next. Only one used hot water, and two clean water for washing. The cans were steamed in 23 dairies, but in no case was the steaming effective. Three had what was considered a complete equipment, a tank with mechanical brush, rinsing tank, steam jet, and air blast.

A physical and bacteriological inspection of 184 empty cans as returned to the shippers during June and July is summarized. The odor of 14 was classified as sour and of 83 as foul. Over 42 per cent, if used without further rinsing, would have added from 500,000 to 4,332,000 bacteria to each cubic centimeter of milk. It is pointed out that milk produced under very insanitary conditions seldom has an initial bacterial content in excess of 20,000. Prompt drying of the cans after washing is considered the most urgent reform.

The proper methods of caring for milk cans are outlined.

**Refrigeration on southern dairy farms,** J. T. BOWEN (*Hoard's Dairyman, 57 (1919), No. 10, pp. 489–491, figs. 5*).—This is a discussion by the author of Bulletin 98 of the U. S. Department of Agriculture (E. S. R., 31, p. 575), based upon the section on cooling milk on the farm in that publication, but considerably augmented. Data are furnished as to the cost of operating quarter-ton and half-ton refrigerating machines under different precooling temperatures. In the Southern States, where ice is scarce, it is held that refrigeration would eliminate the principal hot-weather difficulties in the care of milk. By precooling the milk with spring or well water and by storing up refrigeration it is possible to make a small machine provide refrigeration for a comparatively large herd.

**A study of the alkali-forming bacteria found in milk.** S. H. AYERS, P. RUPP, and W. T. JOHNSON, JR. (*U. S. Dept. Agr. Bul. 782 (1919), pp. 39, figs. 2*).—The authors, working in the laboratories of the Dairy Division, have investigated the occurrence and activities of the group of alkali-forming bacteria, limiting that term to nonpeptonizing types capable of rendering milk alkaline. An intensive study was made of 68 cultures isolated mostly from market milk, a few being obtained from ice cream. Both bacilli and cocci were included. The organisms grew best at temperatures between 20 and 30° C. and had thermal death points ranging from 60 to 65.5° when heated in milk tubes for 30 minutes. No spores were observed.

Record is made of the ability of each culture to ferment ethyl, propyl, and amyl alcohols, dextrose, 22 different organic acid salts, and urea, the results being given in terms of pH values except in the case of the alcohols. Statements are also made with respect to several other substances. Synthetic media were used, nitrogen being supplied by sodium ammonium phosphate with the test substance furnishing the carbon. Dextrose and galactose were fermented readily, lactose and saccharose by a few cultures, and raffinose not at all. The monatomic alcohols were fermented by more cultures than were mannite and glycerin. Study of the organic acid data indicates that the carboxyl radical does not serve as a source of carbon for these organisms. Carbon was most easily obtained from the methyl group. It is held that the characteristic reaction produced by these bacteria in fresh milk is due to the oxidation of the citric acid salts present to alkaline carbonates.

The alkali-forming bacteria (as defined) are considered to be primarily soil organisms. They were present in numerous samples of soil, in water, on the hands of farm laborers, in unsterilized milk utensils, and in small numbers in cow feces. An arbitrary classification based on the substances fermented is proposed.

**A comparison of bacteria counts in whole and skim milk, separator and centrifuge cream.** R. W. LAMSON (*Jour. Dairy Sci., 1 (1918), No. 6, pp. 498–507*).—The author claims that many of the published statements as to the bacterial content of cream are based upon laboratory centrifuging of milk in flasks, and records the results of 10 experiments conducted by the Bureau of Chemistry of the U. S. Department of Agriculture in which it was possible

to compare the bacterial counts of separator skim milk, separator cream, centrifuge skim milk, and centrifuge cream with the counts of the whole milk sample from which they were derived. Most of the samples were analyzed independently by more than one bacteriologist and each observer's results are tabulated.

Averaging the separate observations on each sample, it was found that in 3 cases the separator skim milk and in 6 cases the separator cream showed a higher count than the whole milk. In only one case was a count of centrifuge skim milk higher than whole milk, but centrifugally separated cream in every case was higher. "These results for separator cream are in quite close agreement with the findings of other investigators who actually worked on separator cream. The results obtained on centrifuge cream are also very similar to those reported by other writers on this class of product."

No close relation was found between the bacterial count of the cream and the percentage of butter fat.

On the basis of these results and of observations made in New England creameries in the summer of 1917, the author advocates the same bacteriological standard for cream as for market whole milk.

**The influence of the separator upon distribution of bacteria in milk and cream,** L. D. Bushnell and O. W. Hunter (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 61–69*).—Observations made at the Kansas Experiment Station on a number of milk samples are summarized.

The number of organisms revealed by agar plates in 23 tests of good market milk averaged for whole milk 80,000, skim milk 107,500, cream 101,100, and bowl sediment (per gram) 399,800. The cream in each case was added to skim milk and the mixtures showed an average count of 157,900. The increased counts are attributed to the breaking up of clumps. Fifty-five tests were made on a lower grade milk hauled from distant farms and showed similar results; the bowl sediment was not examined in these cases.

The amount of butter fat seemed to have no effect on the distribution of bacteria between cream and milk. Considerable differences were found between different separators, between different runs of the same separator, and even between different samples of the same milk drawn from the separator spouts during the same run.

**The microbial flora of graded cream,** O. W. Hunter and L. D. Bushnell (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 69–76*).—Observations from the Kansas Experiment Station are reported showing that the grading of cream by flavor and odor was more satisfactory than grading by acidity in discriminating between cream high in lactic acid bacteria and cream whose microbial flora consisted, predominantly, of organisms harmful or not useful in butter making.

**Sweet cream butter,** H. A. Bendixen (*Hoard's Dairyman, 57 (1919), No. 10, p. 499, fig. 1.*—The author recites the success of a cooperative creamery in Iowa in producing sweet cream butter for the U. S. Navy, and predicts that this type of butter will be increasingly in demand because of its keeping qualities.

## VETERINARY MEDICINE.

**Pyotherapy,** H. Velu (*Rev. Gén. Méd. Vét., 28 (1919), No. 330, pp. 297–311*).—This is a general review and discussion of the literature on the subject, including a comparison of the methods employed by different workers in the preparation and use of pyovaccines and the results and mode of action of pyotherapy. A bibliography of 26 titles is appended.

**Behavior of bacteria toward arsenic**, H. H. GREEN and N. H. KESTELL (*So. African Jour. Sci., 15 (1919), No. 5, pp. 369–374*).—This is a preliminary report of an examination of arsenic-resistant bacteria in soil, air, feces, and cattle dips.

Resistant types were found to be infrequent in soil and air but fairly frequent in feces, about 10 per cent of the bacterial count of fresh stable manure being moderately tolerant and 1 per cent highly tolerant to arsenic. In arsenical dipping tanks an automatic enriching of resistant fecal bacteria and suppression of sensitive forms apparently take place.

Variations in tolerance of different bacteria for arsenic were found to be very marked. Certain groups, notably the "subtilis" group, were very sensitive, while others, notably the "putidum" group, were very resistant. The colon-typhoid group, while sensitive as a family, contained one or two resistant members.

Of the 12 or more arsenic-resistant species examined, only two showed any chemical activity toward arsenic, namely *B. arsenoxydans* which oxidizes arsenite to arsenate and *B. arsenreducens* which reduces arsenate to arsenite. No relationship was discovered between arsenate reduction and nitrate reduction.

**The Wright and Carrel methods of treating wounds**, VAN WALLENDAEL (*Ann. Méd. Vét., 64 (1919), No. 3–4, pp. 86–93*).—The Wright and Carrel methods of treating wounds are discussed with particular reference to their applicability in veterinary practice. The Wright method is thought to have no practical application in veterinary medicine, but the Carrel method with certain modifications is considered excellent for the treatment of fistulous withers, boils, synovitis, and other lesions.

It is recommended that the Carrel tubes in contact with the wound be kept in place by a gauze compress soaked in Dakin's solution, and that 10 cc. of the solution be introduced into the tubes every two hours by means of a simple syringe. The wound and its surroundings should be washed every day with a liquid soap (sodium oleate), diluted with a little hot water and then with ether. The progress of the treatment should be controlled every two days by a bacteriological examination of the secretions, and the wound closed when sterile or when it no longer contains *Bacillus streptococcus* or *B. perfringens*. The presence of staphylococci is thought not to contraindicate the closing of the wound.

**Experimental researches on antistreptococcic immunity**, S. VINAVER and V. FRASEY (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 17, pp. 606–608*).—The authors report the succesful immunization of horses by means of a single relatively large dose of a living 24-hour culture in ascitic bouillon of a human strain of streptococci virulent for mice. The serum from an animal thus immunized is said to be superior to that obtained by fractional immunization over a period of several months, showing after 15 days very active preventive properties not only against the particular strain used for immunization but also against other strains of streptococci.

The intravenous injection of as much as one liter of the living culture is said to provoke no greater thermal reaction, but at the same time no better results than a much smaller dose.

**Complement inactivation by bacteria**, H. RITZ and H. SACHS (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 26 (1917), No. 5, pp. 483–502*).—The results are reported of a study of complement inactivation by suspensions of *Bacillus prodigiosus*.

It was found that suspensions of this bacillus exerted an anticomplementary action on guinea pig serum when warm but only to a small degree in the cold (0° C.). The action, which required contact with the serum for some little

time, was within certain limits proportional to the amount of serum. The action was prevented by the action of acids and alkalis.

Attention is called to the resemblance between the anticomplementary action of bacillary suspensions and that of cobra poisoning, and the possible nature of the action is discussed.

**A method for the preparation of prophylactic and autogenous lipovaccines,** E. C. Rosenow and A. E. Osterberg (*Jour. Amer. Med. Assoc., 73 (1919), No. 2, pp. 87-91, figs. 3*).—The method, which is described in detail, for the preparation of large quantities of specific oil vaccines and for smaller amounts of autogenous lipovaccines, is said to eliminate the chief difficulty encountered in the usual preparation of lipovaccines, namely, a successful drying of the bacteria. This is accomplished by removing the water by distillation in vacuo from a water-bacterial-oil emulsion. It is said to prevent clumping of the bacteria and to obviate the necessity of grinding the resulting product.

In the application of this method to the preparation of autogenous lipovaccines the common 6-oz. nursing bottle is used as a culture flask, centrifuge tube, and vacuum flask. The bacteria are grown in 150 cc. of glucose broth for 24 hours, centrifugalized, the supernatant clear broth decanted, and the sediment suspended in 10 cc. of a 1.5 per cent solution of purified cresol in water or salt solution. After standing at a temperature of 37° C. for from 2 to 15 hours, or until found to be sterile, the suspension is centrifugalized, the supernatant fluid is decanted, 6 cc. of cottonseed oil containing 2 per cent anhydrous lanolin and a number of sterile glass beads or steel shot are added, and the mixture is emulsified by shaking for a short time. The water is then removed very readily from the mixture by applying the vacuum and immersing the bottom of the bottle in water heated to 60° until bubbling ceases and the mixture becomes clear. The clearing usually takes place in from 20 minutes to 1 hour.

The method is said to give perfectly even homogeneous suspensions with various species of bacteria.

**Experiments on the effect of agglutinins,** B. Fujimoto (*Jour. Immunol., 4 (1919), No. 3, pp. 67–76*).—The agglutinin obtained by immunizing rabbits with *Bacillus coli* was used to determine whether agglutinins have any influence on the glycolytic action of bacteria, on the permeability of bacteria and red blood corpuscles for glucose solution, and on the resistance of red blood corpuscles for salt solution. The results obtained are summarized as follows:

"The glycolytic action of the living *B. coli* may be markedly weakened by agglutinin. The agglutinin is able so to change the cell membrane of the bacteria that their endoenzym can permeate it. Neither agglutinin nor hemagglutinin alters the permeability of bacteria and red blood corpuscles for glucose. The resistance of the red blood corpuscles to hypotonic solutions is slightly decreased by agglutinin or hemolysin."

**A method for the production of a homogenous suspension of Bacillus anthracis to be used in agglutination reactions,** A. Noble (*Jour. Immunol., 4 (1919), No. 3, pp. 105–109*).—A satisfactory suspension of *B. anthracis* for agglutination reactions has been prepared as follows:

Four strains of *B. anthracis* were transplanted daily for ten days on plain agar and incubated at 42.5° C. until a sporeless and very vigorous growth was obtained. Each strain was then planted on plain agar in quart flasks and incubated for 12 hours at 42.5°. The growths were washed off in physiologic salt solution containing 0.5 per cent formalin (about 100 cc. to a flask), and the suspensions shaken in a mechanical shaker for 48 hours. After standing for several days and being tested for sterility, equal parts of each suspension were mixed in a cylinder, shaken for 24 hours, and allowed to stand over night. The upper portion, containing a homogeneous suspension, was filtered several

times through four thicknesses of sterile cheesecloth. The suspension was then diluted with physiologic salt solution plus 0.5 per cent formalin to a density corresponding to a suspension of *B. typhosus* containing 2,000,000 bacteria per cubic centimeter.

The suspension thus prepared is said to be perfectly homogeneous and to show no spontaneous agglutination. By means of it antianthrax sera from 13 horses have given agglutination titers of from 1 in 6,400 to 1 in 20,000, as against titers of from 1 in 80 to 1 in 200 in normal horses. In the absence of a satisfactory animal-protection test or method of complement fixation, the agglutination test is considered to be practicable as a method for standardizing antianthrax serum.

**Vaccination against anthrax in Brazil,** A. Moses (*Rev. Vet. e Zootech., 9 (1919), No. 1, pp. 3–10*).—Three vaccines used in Brazil against anthrax are described.

The first consists of a culture in 2 per cent peptone solution of anthrax bacilli attenuated by heating for 12 days at a temperature of 42° C. It is used for bovines in a single dose of 2 cc., corresponding to eight times the dose formerly used according to the classic method of Pasteur in two inoculations at 15 days' intervals. The best results for other animals have been obtained by using 1 cc. for horses, donkeys, and hogs, and 0.5 cc. for calves and sheep. The second vaccine is prepared in a similar manner with slight variations, and is used in doses of 2 cc. for adult animals indiscriminately. The third is a spore vaccine prepared by growing on a solid culture medium at 35 to 37° for several days a mixture of different strains of anthrax bacilli of attenuated virulence. An emulsion of this culture rich in spores is prepared in appropriate solution and heated at 60° for several hours. It is used in doses of from 0.5 to 1 cc., the dose being repeated 10 times.

The first vaccine, which is in use officially by the Brazilian Department of Agriculture, is considered the most satisfactory and is said to have better keeping qualities than the Pasteur vaccine.

**Inoculation as a prophylactic measure against foot-and-mouth disease,** D. Lutrario (*Off. Internat. Hyg. Pub. [Paris]. Bul. Mens., 11 (1919), No. 3, pp. 266–272*).—A summary is reported of the results of an extensive investigation conducted during 1914–1917 by a special commission in Italy for the purpose of developing possible means of immunization against foot-and-mouth disease.

The method of immunization proposed by C. Terni consists of reenforcing and prolonging by successive inoculations of specially prepared foot-and-mouth virus the immunity already acquired by a natural or artificial attack of the disease. Under these conditions the inoculation of virus causes a rise in temperature but with no internal manifestations of the disease. In general, after three inoculations an active hyperimmunity against the natural infection is produced which lasts through the entire period of use of the dairy cows.

For intravenous use the committee recommends a first inoculation of from 25 to 50 cc. of hyperimmunized blood of either young or adult animals, followed 4 or 5 days later by a similar inoculation with the addition of 25 cc. of a 1 per cent solution of filtered virus, or 50 cc. of blood of a fixed virulence. This is followed in from 8 to 10 days by a similar inoculation. For subcutaneous use the same inoculation is employed, with the exception that the dose of hyperimmunized blood is doubled.

Investigations conducted by G. Cosco, with the collaboration of Aguzzi, showed that both the red corpuscles and the serum of the blood of animals with foot-and-mouth disease are virulent during the period of the fever, and that the red corpuscles after repeated washings with sterile physiologic solution can reproduce the disease in cows when inoculated subcutaneously, even in

as small doses as 1 cc. The intravenous injection of virulent blood obtained from producing animals after a series of passages and a minimum period of incubation of about 70 hours did not result in the development of the disease, provided the dose did not exceed about 30 cc.

The treatment recommended as a result of this study is a series of three intravenous injections of virulent blood in doses of 25, 30, and 45 cc., respectively. The first inoculation is said to be followed an hour or two later by a rise in temperature, which persists for 8 or 10 hours. The fever is less marked after the second and often insignificant after the third inoculation. A period of 10 days should elapse between successive inoculations. A case is reported of the successful immunization of two cows by this method.

**Researches on ulcerous lymphangitis**, R. Van Saceghem (*Ann. Méd. Vét., 64 (1919), No. 3–4, pp. 80–83*).—The author has used with success for the treatment of ulcerous lymphangitis in its early stages subcutaneous inoculation of a pure culture of the bacilli of Preisz-Nocard. It is emphasized that this treatment should be begun as early as possible in the disease, before sensitization to the bacilli has taken place and extensive lesions have been produced.

**Treatment of ulcerous lymphangitis**, R. Van Saceghem (*Ann. Méd. Vét., 64 (1919), No. 3–4, pp. 83–86*).—The method noted above is being employed to immunize against future attacks horses which have been cured of ulcerous lymphangitis.

**A progress report on Sarcocystis tenella.—II, Seasonal infection**, J. W. Scott (*Wyoming Sta. Rpt. 1918, pp. 95–116*).—This continuation of earlier work (E. S. R., 34, p. 658) has been noted from another source (E. S. R., 40, p. 585).

## RURAL ENGINEERING.

**Irrigation investigations**, G. E. P. Smith and A. L. Enger (*Arizona Sta. Rpt. 1917, pp. 481–491, figs. 2*).—In continuing the irrigation investigations (E. S. R., 39, p. 792), in the Casa Grande Valley, measurements of seepage losses have not confirmed those of the previous year, but water table fluctuations, including the special observations in the vicinity of active pumping plantts, have confirmed results previously reported.

Deep well drilling in the Lower Gila Valley, in which the depth of drilling was increased, has revealed an extensive aggregate potential water supply, which is considered important from the standpoint of further development but is thought to be confined to the bottom lands. Evaporation studies made in three localities of widely different climatic conditions but under approximately similar soil conditions showed in all three locations a close agreement between temperature and evaporation, which is, however, modified by wind movement. "Reduced to the lowest terms, the evaporation-rate depends upon temperature and the vapor pressure directly at the water surface."

An investigation of machine-made cement pipe for use in irrigation lines leads to the conclusion "that pipe-making by machinery is entirely practical, that the pipe is much superior in quality to handmade cement pipe and that the cost is less. . . . For the larger laterals and main canals cement lining is the best method of improvement. Careful estimates show that by lining the canals of the Salt River Valley enough water will be saved to permit an increase of 25 per cent in the project area."

A tabular summary of the station pumping plants is given.

**The Tempe drainage ditch**, A. E. Vinson and C. N. Catlin (*Arizona Sta. Rpt. 1917, pp. 474–476*).—Analyses of samples of water from the Tempe drainage ditch are reported.

While the ditch was completed early in 1917 and the season was very dry, great fluctuations in the composition of the drainage water are noticeable. "March 9 the water, which had hitherto been hard, was alkaline, containing 3.4 parts per 100,000 of black alkali; but the following month, April 10, it was again found to be as hard as it had been the previous November. The analysis made in February seems to indicate that the permanent hardness of the water was decreasing at that time. During the summer months the hardness remained fairly constant, but increased three or four fold in September, then became neutral in October and again strongly black alkaline in December, which is the last analysis available.

"The total solids dissolved in the water and the chlorids showed similar fluctuations. September 15 both total solids and chlorid reached a maximum, but dropped abruptly to about one-half that amount in October. This period of high solids and chlorids was accompanied by very high permanent hardness. In November and December the temporary hardness ('lime') increased to double the average for the other months of the year, which had been nearly uniform. . . .

"The present fluctuations . . . are probably due to changes in the amount of seepage from various areas according to the amount of irrigation, and also to overflow reaching the ditch which would tend to dilute the usual seepage flow. At no time has the drainage water been entirely satisfactory for irrigating purposes on account of its high salt content."

**Public Roads** (*U. S. Dept. Agr., Public Roads, 1 (1919), Nos. 11, pp. 40, figs. 23; 12, pp. 44, figs. 25; 2 (1919), Nos. 13, pp. 36, figs. 20; 14, pp. 40, figs. 29*).—These numbers of this periodical contain miscellaneous notes and the following articles:

*No. 11.*—New Roads Official Named; The Engineer in Road Work, by R. Wiley; Typical Specifications; New Regulations for Vouchers for All Federal-Aid Projects; 6,146,617 motor vehicles in U S., by A. P. Anderson (see p. 383); Building an Arizona Project; Bureau of Public Roads in the War; Federal-Aid State Maps; Pennsylvania Sees End of Mud Age, by W. G. Sproul; Use of Calcium Chlorid as Dust Preventive for Gravel Roads, by W. L. Ulrich; Use of Sand Clay from Salt Flats in Surfacing Texas Roads, by R. H. Phillips; Use of Labor-Saving Devices in Concrete Road Construction, by L. I. Hewes; The Master Record of Federal Aid; February Federal-Aid Allowances; and Tests of Road Building Rock in 1918.

*No. 12.*—Some Reasons for Success and Failure of Bituminous Macadam, by F. C. Pillsbury; Water and the Subgrade, by J. L. Harrison; Convenient Project Record; Report on Rural Concrete Roads; Notes and Suggestions for Inspectors on the Construction of Concrete Pavements; Memorandum on Construction of Concrete Roads, by L. I. Hewes; Federal-Aid Record Shows Big Road-Building Program; Thickness of Concrete Slabs, by A. T. Goldbeck (see p. 381); and Determining Sizes of Culverts, by O. L. Grover (see p. 381).

*No. 13.*—Colorado's First Federal-Aid Road, by C. E. Learned; Mountain Highway Reconnaissance, by T. A. Bedford; April Federal-Aid Projects Exceed Previous Records; Life's Pathway, by A. D. Williams; Arizona One of the Pioneer States to Utilize Convict Labor on Its Roads and Bridges, by B. M. Atwood; Building Oklahoma State Roads With Convict Labor, by H. C. Smith; Florida Has Efficient State Convict Road Force, Plans to Use It on Higher Type of Construction, by W. F. Cocke; Maryland's Governor Believes Work on Roads in Line with Ideas of Proper Treatment of Convicts, by E. C. Harrington; Illinois Uses Convicts in Preparing Material, by C. Older; Louisiana Finds Work of Convicts Satisfactory, Cost of Construction Less Than With Free Labor, by D. Buie; Experience Gained on Rhode Island Roads Makes Ex-convicts

Available for Work after Release, by I. W. Patterson; New Jersey Maintains Three Convict Road Camps, Plans to Expand System That Has Shown Value, by W. G. Thompson; Good Results With Convict Labor in Wyoming, by Z. E. Sevison; Convict Labor on the Mountain Roads of Utah Proves a Notable Success in Heavy Construction, by I. R. Browning; Convict Work on Roads of Idaho Could be Made Profitable to State and Beneficial to the Men, by H. C. Allen; and Nebraska Experiment Produces Good Results, by G. E. Johnson.

*No. 14.*—Secretary Houston Discusses Federal Road Commission Bill; Delaware's Federal-Aid Work, by A. R. Losh; Suggestions for Contractors on Concrete Road Construction, by C. E. Learned; 11,326 Miles of Federal-Aid Roads in Approved Projects; Bonding New Cement-Mortar and Concrete to Old in Tests, by W. E. Rosengarten (see p. 382); Road Making at Front in France, by F. G. Eason; and The Commercial Sizes of Crushed Stone Aggregates, by F. H. Jackson and C. W. Mitman (see p. 382).

Determining sizes of culverts, O. L. Grover (*U. S. Dept. Agr., Public Roads, 1 (1919), No. 12, pp. 39–44*).—Tables and formulas showing the practices of some of the State highway commissions and railroads on the determining of drainage areas and waterway areas are compiled in convenient form and accompanied by brief discussions.

Thickness of concrete slabs, A. T. Goldbeck (*U. S. Dept. Agr., Public Roads, 1 (1919), No. 12, pp. 34–38, figs. 7*).—This is a report on pressure measurements made under a concrete road to discover how the road slab is stressed directly under the wheels of heavy trucks. The road surfacing was 18 ft. wide, 8 in. thick at the center, and 6 in. thick at the sides, and consisted of 1 : 1½ : 3 gravel concrete having a crushing strength of 3,190 lbs. per square inch. The soil of the subgrade consisted of sticky clay, which, when wet, has very little bearing value. A class B standard army truck loaded with 5 tons of sand was used, and the load on the front axle was 5,000 lbs. and on the rear axle 17,000 lbs.

It is tentatively concluded that a concrete road slab under the action of traffic or under the influence of frost and different percentages of moisture in the subgrade is continually bending, so that the reaction pressures between the subgrade and slab are neither constant nor uniform in intensity. The reaction pressures due to heavy wheel loads were found to be a maximum directly under the loads and vanished to zero in a comparatively small radius, partially depending upon the intensity of the load.

"A heavy wheel load is distributed over a larger radius than a light wheel load. For this particular subgrade a load of 8,500 lbs. has a radius of distribution of pressure of about 6 ft., most of the pressure, however, being exerted over a radius of about 4 ft. As the concrete slab recovers from its deflection after the passage of a load more readily than the soft subgrade, there is a tendency for the continual deflection of the slab to produce areas having very little or no bearing. . . .

"As nearly as can be estimated from the results of this test, the tensile stress in an 8-in. concrete slab directly under an 8,500-lb. wheel load at rest on the road is only 34 lbs. per square inch when the slab is well supported on the subgrade. As the modulus of rupture of 1 : 1½ : 3 concrete is about 600 lbs. per square inch, this pavement should be able to withstand considerable impact before cracking. Should the concrete arch over very soft spots, so that there is no support directly under the load, the tensile stress may become very high. Such a condition arises when the sides of the slab are raised by frost action or possibly when the subgrade is worked any from under the slab by continual deflection. It is probable that the tensile stress which results in the slab

directly under the heavy wheel loads is never very great as long as the slab rests on the subgrade, and it is unlikely that the slab design would ever be controlled by this stress."

**The commercial sizes of crushed stone aggregates**, F. H. JACKSON and C. W. MITMAN (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 14, pp. 35–40*).—A survey of the present practice in the States of Ohio, Kentucky, Tennessee, North Carolina, and Georgia, for the purpose of securing data to be used in the development of a system of standard sizes and uniform nomenclature of crushed stone products, is reported. The results confirm the conclusions of a report previously noted (E. S. R., 39, p. 494), and it is concluded that the necessity for standardizing stone sizes has been demonstrated.

**Bonding new cement-mortar and concrete to old in tests**, W. E. ROSENGARTEN (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 14, pp. 26–34, figs. 5*).—The results of an extensive series of tests conducted in the Bureau of Public Roads to obtain definite data on the relative value of various methods of increasing the strength of bond between new and old cement mortar and concrete are reported. These tests included "(1) tests on the bond strength in tension of a 1:2 mortar in the form of the standard tension briquette, (2) tests on the bond strength in cross bending of a 1:⅔:1⅓ concrete in 4 by 4 by 14 in. prisms bonded to concrete slabs, (3) tests on the bond strength in shear of a 1:⅔:1⅓ concrete in specimens in the form of 8-in. diameter cylindrical disks, 2 in. high, [and] (4) tests on the permeability or water-tightness of the joints formed by various bonding methods. The same specimens were used in this series as in the shear tests." The following results were reached regarding the tensile strength of bonds:

It was found that the ability of fresh mortar to adhere to older material decreased rapidly as the old set up. Where the older material had set for 24 hours before adding the fresh, the bonding strength was but 44 per cent of that of monolithic construction. Further aging of the old mortar caused a slight decrease in the bonding ability, which at 7 days was 39 per cent of the original and at 28 days was reduced to 35.5 per cent.

It was possible, however, to increase the bond by treating the old surface, either by roughing with a steel tool, or by applying dilute hydrochloric acid of 1:10 strength. Roughing the surface increased the strength of bond 20 per cent and the acid treatment increased it 13 per cent, except where the old concrete had aged seven days, in which case there appeared an unexplainable detriment to the bond, due to the acid treatment. Combining both roughening and acid treatment gave but a slightly greater bonding ability than either by itself.

The application of a thin layer of cement butter as a bonding medium had a decided effect in increasing the adhesive strength. Twenty-five per cent increase in strength was developed by this method, and 28 per cent if the butter layer was allowed to stand one hour prior to adding the fresh mortar. Hard tamping of the new mortar against the old increased the strength of bond about 8 per cent.

The broken surface showed a greater bond strength than either the plain molded or natural surface, but roughing of the two latter placed them on a par with the broken surface. The ability to bond to the molded and natural surface appeared about equal, although surfaces molded against forms showed a decrease in strength as the age of the old concrete increased.

With reference to cross-bending strength, it was found that by careful treatment new concrete can be made to adhere to old with a strength equal to 60 per cent of monolithic concrete. If no special treatment other than cleaning is given the old concrete, a bond strength of but 20 per cent of the

monolithic concrete is developed. Roughening of the old concrete or treatment with dilute hydrochloric acid increased the bond strength by 20 per cent, as did also a bonding medium of a thin layer of neat cement butter. Tamping the fresh concrete hard against the old concrete increased the bond strength 5 per cent.

With reference to shearing strength, it was found that the strength of a joint was greatly increased by treatment of the surface of the old concrete. It was further found that there was no danger of leakage at a joint made in concrete of a mixture as rich as 1:⅔:1⅓ under pressures up to 40 lbs. per square inch when the surface of the old concrete had been treated.

The results of tests by others, bearing on the subject, are also reviewed.

**[A total of 6,146,617 motor vehicles in the United States]**, A. P. ANDERSON (*U. S. Dept. Agr., Public Roads, 1 (1919), No. 11, pp. 8–16, fig. 1*).—Data are given covering registrations, licenses, and revenues in the United States during the calendar year 1918.

A total of 6,146,617 motor cars and commercial vehicles and 240,564 motorcycles were registered in 1918 in the 48 States and the District of Columbia. Registrations and license fees, including chauffeurs, operators, and dealers, amounted to a total of $51,477,416.61. These figures do not include about 107,000 automobiles and motor trucks manufactured for the Government during the year. As compared with 1917 the data for 1918 represent an increase of 19 per cent in the number of cars and 27 per cent in revenues.

**Motor transportation for rural districts**, J. H. COLLINS (*U. S. Dept. Agr. Bul. 770 (1919), pp. 32, figs. 5*).—This bulletin reports in general the results of preliminary studies of rural motor routes established, or in process of establishment, with the purpose to call to the attention of operators and prospective operators those features of the industry which apparently are not understood or appreciated.

It was found that there are five general classes engaged in rural hauling on a schedule basis as follows: (1) The farmer who hauls for his neighbor or for the community as well as for himself, (2) the regular local truck operator with limited capital, whose income is derived largely from the business, (3) local automobile or truck agencies operating as a side-line, (4) city transfer companies, and (5) large corporations operating a fleet of trucks and commanding considerable capital. It was found that the four important factors which must be considered by the beginner in the field of rural motor transportation are (1) the volume of farm products produced along the contemplated route, (2) the volume of miscellaneous hauling which can be secured to supplement regular loads, (3) competition with other carriers, and (4) the character of the highways. "Above all, attention should be concentrated on the problem of arranging for loads so that there is a profitable load on all trucks whenever they are operated." It is stated that in considering competition particular attention should be given to rates, schedules, and delivery arrangements. Good roads are considered a prerequisite to successful motor truck operation.

With reference to certain operating costs, it was found that the gasoline mileage for trucks of different sizes showed a very wide range under varying conditions. Data from about 60 typical motor routes showed from 5 to 9 miles per gallon of gasoline for 2-ton trucks, 4 to 6 miles for 3-ton trucks, and 3 to 5 miles for 5-ton trucks. Drivers' wages varied from $2.75 to $7.50 a day. Depreciation was estimated by operators at from 20 to 33⅓ per cent of the cost of the truck annually. The annual average interest on the investment was calculated by the following formula: $\frac{A+1}{A} \times \frac{C \times B}{2} =$ average yearly interest. In this formula A represents the estimated life of the truck in years under actual operating

conditions, B represents the original investment, and C represents the rate of interest. Annual costs for repairs ranged from about $100 to as high as $800 or $900. Where trucks were kept in a constant state of repair the annual repair charge was relatively small. For solid tires it was found that this cost ranged from 1 to 4 cts. per mile. It was found that the solid tire is more commonly used because it is more adaptable and cheaper than the pneumatic, does not suffer from blow-outs or puncture, and stands up well on bad roads and under very heavy loads.

Numerous other suggestions and information are given covering cost-accounting, delivery methods, collection and delivery arrangements, etc. A standard bill of lading, a driver's daily report card, and insurance provisions covering shipments are suggested.

It is concluded that the chief factor limiting development in the field of rural motor hauling is the cost of operation as compared with that of railroads, electric lines, and boat lines. The limiting factor second in importance is considered to be the condition of average country highways. Financial responsibility is considered the limitation third in importance. It is generally concluded that under proper conditions, and where a fair knowledge of the limitations and difficulties obtains, motor truck transportation promises to play an important rôle in rural districts.

**The farm tractor in the Dakotas,** A. P. YERKES and L. M. CHURCH (*U. S. Dept. Agr., Farmers' Bul. 1035 (1919), pp. 32*).—This reports data obtained from over 300 tractor owners in North and South Dakota, based on operating results during the fall of 1917 and spring and fall of 1918.

It was found that the principal disadvantage of the tractor in the Dakotas lies in its inability to do satisfactory work under moist soil conditions. Difficulty of efficient operation was the next disadvantage.

Of the farmers reporting, 44 per cent were able to increase the farm acreage. Over half of those reporting owned 3-plow machines, the remainder being about evenly distributed among the 2-plow, 4-plow, and larger sizes. After using these tractors nearly the same percentage recommended the 3-plow tractors as owned them, 30 per cent recommended the 4-plow tractor, and only 5 per cent recommended the 2-plow tractor. The minimum number of acres on which the 2, 3, or 4-plow outfits were profitable were 185, 225, and 314 acres, respectively.

The tractors were used an average of 50 days annually, about 40 days on home work and 10 days on custom work. The number of days the tractor was used on home work increased rapidly with the size of farm, and the number of days on custom work decreased gradually.

The average quantity of fuel consumed per acre in plowing was 2¼ gal. The fuel cost per acre for plowing averaged about 38 cts. for kerosene and 69 cts. for gasoline. The average cost per acre for plowing for fuel, oil, and grease was about 78.5 cts. where gasoline was used and 49 cts. where kerosene was used. The cost for repairs for 2, 3, and 4-plow outfits averaged 15, 13, and 11 cts. per acre plowed, respectively, and the corresponding average depreciation, assuming a 9-year life for a tractor, was estimated at 41, 36.5, and 31¾ cts. The cost per acre for man labor at $4 per day for the 2, 3, and 4-plow outfits averaged 63.5, 47, and 36¾ cts., respectively, and interest at 6 per cent averaged 11, 10, and 8.5 cts., respectively, per acre plowed. The total approximate cost of plowing an acre, using kerosene for fuel, averaged $1.80, $1.56, and $1.38 for the 2, 3, and 4-plow outfits, respectively, and where gasoline was used for fuel, $2.09, $1.85, and $1.67. Horses were displaced on only about 57 per cent of the farms where tractors were used and where no increases was

made in the farm acreage, and amounted to an average of slightly less than 4 horses displaced on each farm by the purchase of the tractor.

**Poultry buildings: Laying and breeding houses**, H. R. LEWIS and W. C. THOMPSON (*New Jersey Stas. Bul. 325 (1917), pp. 5–102, figs. 57*).—This bulletin is the first of a series of four which deal with the construction and equipment of buildings in general demand for use in poultry farming. This number deals with laying and breeding houses.

The first part of the bulletin is devoted to a theoretical discussion of the principles governing the design and construction of poultry houses.

The second part reports the results of a two-season study of the cost and winter and summer temperature and humidity of six different types of poultry houses. Type-J house is 20 ft. deep and 40 ft. long and is somewhat similar in design to the type known as the Wood's fresh-air house. The roof construction is of the half-monitor type, with an entire glass front in the peak. The front is entirely open from 2 ft. above the ground upward, the opening being covered with inch wire. Type-K house is of half-monitor construction, somewhat similar to J except that it is elevated about 2 ft. from the ground. The dimensions are 16 by 40 ft. Type-L house, known as the New Jersey multiple unit house, is 20 by 40 ft. in dimension and houses 200 birds. The house has concrete foundation walls and is of the shed-roof type. Type-M house is a shed-roof type, 16 by 40 ft., and built entirely of hollow building tile stuccoed with cement plaster on the outside and heavily whitewashed on the inside. Type-R house is a shed-roof type, built entirely of lumber, cheapness being a primary object. It is 36 ft. long by 14 ft. deep. The cost per bird was 77 cts. Type-P house represents a 48-ft. section of a 144-ft. laying house and is divided into four pens 12 by 16 ft. It is a shed-roof type of frame construction and has a hinged clapboard on the outside of the back wall for ventilation. A concrete floor and foundation was built on deep cinders. With reference to cost, the cheapest house was the R type, 77 cts. per bird (not including labor), followed in order by the L, J, P, K, and M types, with 88 cts., $1.08, $1.12, $1.24, and $1.44.

The temperature studies led to the conclusion that in order to be efficient the average poultry house should be warmer than the outside normal temperature during the winter and cooler than the outside normal temperature during the summer. "These differences in temperature should be much greater on the plus side during the winter than is shown on the minus side during the summer. The use of solid glass sash in the poultry house with no adequate means of continuous ventilation is conducive to frozen combs and cold. An increase in height of the poultry house not only makes the construction more costly, but is apt to make the house colder in winter by increasing the exposed wall area, thus making possible more radiation. The figures show that a house with some muslin and some glass, of the shed-roof type, with provision for ventilation, is the house which more nearly fulfills the above requirements." During the winter the P type of house was the warmest, followed in order by the L, M, J, R, and K types. The K type was exceptionally cold. During the summer period the R type was the coolest, followed in order by the M and L types.

The moisture studies showed the L type to be the driest house, followed closely by the J type. The type-K house was found to be the dampest.

With reference to sunlight it was found that "a shed-roof house from 16 to 20 ft. deep, with openings in the front wall ranging from 2 ft. above the ground to 7 ft., is a most excellent arrangement. These openings, distributed almost continually along the front, were found to provide the most

complete and uniform distribution of sunlight, type house L being exceptionally well planned with reference to the total amount of sunlight secured on the floor at one time, and also with reference to the large area of floor space which was bathed in sunlight sometime during the day."

A consideration of relative total efficiency of the types "shows that the houses stand in the following order, L, R, J, P, M, and K; that is, type house L, considered from the standpoint of low cost, warmth in winter, coolness in summer, and dryness, was the most efficient type. Type houses M and K, the former of hollow-tile construction and the latter elevated, with an entire glass front, are not desirable types."

The third part of the bulletin discusses in considerable detail a number of different standard types of poultry houses which have been tested out at the station. A bibliography is appended.

## RURAL ECONOMICS.

**Report of committee appointed by the Secretary of Agriculture to consider the subject of farm organization as one of the divisions of research work of the proposed Bureau of Farm Management and Farm Economics** (*U. S. Dept. Agr., Off. Sec. Circ. 135 (1919), pp. 12.*—This report represents the conference of April 17–19, 1919, as outlining studies for a proposed division of farm organization in the proposed Bureau of Farm Management to include types of farming covering determination of enterprises; balance or combination of enterprises; size of business, farm plan or layout; effective use of labor and equipment; intensity of production; and business methods. It states briefly the value of survey, cost accounting, observation, geographic, historical, statistical, and experimental methods of studying farm organization. Recommendations as to procedure in bringing about cooperation between the Office of Farm Management and agricultural colleges and experiment stations, and suggestions for a memorandum of agreement that should be drawn up between the U. S. Department of Agriculture and the colleges or stations are made.

**Farm types in Nebraska, as determined by climatic, soil, and economic factors,** R. R. Spafford (*Nebraska Sta. Research Bul. 15 (1919), pp. 5–85, figs. 38*).—This bulletin treats of the agricultural areas of Nebraska, as determined by climatic, soil, and economic factors, the emphasis being placed upon the kind of farm crops grown and their yields. The data were principally derived from the Thirteenth Census and cover the crop year 1909. The effect of heat and other factors upon the acreage of crops treated as annuals, the size of the farm in relation to rainfall, and other factors in the Great Plains are discussed in detail. Farm types are grouped and farm-type areas described and located. Acreage, yield, and value of crops, crop indexes, and live-stock and miscellaneous statistics are given.

**Dairying and general farming for the timbered section,** A. J. McGuire (*Minnesota Sta., Spec. Rpt. Grand Rapids Substa. 1904–1914, pp. 37, figs. 19*).—This report is a résumé of results of work at the substation at Grand Rapids, Minn., from 1904 to 1914, to find the most practical and profitable system of farming for the timbered section of northern Minnesota, and especially to demonstrate making a living from 20 acres or less under cultivation while clearing and developing more land to a point where the farm can be made most profitable. Some of the conclusions arrived at are as follows:

Dairying, with potatoes as a cash field crop, is believed to be the most profitable system of farming for the average farm of the timbered section of northern Minnesota. A production of 200 lbs. of butter fat a year is necessary for a cow to be profitable from a business standpoint, even on moderately priced land.

The crops found most profitable for the average farm of the timbered section of northern Minnesota were oats, clover, fodder corn, potatoes, and rutabagas. A 3-year crop rotation of grain, clover, and cultivated crops was found the best system of cropping for large yields.

Clover seeded among the stumps on cut-over land produced excellent pasture. Dairy cows on the experiment farm produced as much as 40 lbs. of butter fat for the pasture season from an acre of cut-over land pasture that was the result of clover seeding.

Only potatoes should be sold from the farm, other crops being fed and sold in the form of butter fat and other finished products. Practically all kinds of roots and vegetables were grown successfully. Plums, raspberries, currants, and strawberries were grown with continued success, but apples were a failure. Swamp land, known as "muskeg," was tile-drained and thoroughly tilled, but proved unsatisfactory for crop production.

Pig raising was found profitable in connection with dairying. Poultry on a small scale was profitable, but less so on a large scale. Sheep gave fair returns.

Tables are drawn up to show different factors that influence profit or loss in dairying, records of the dairy herd 1904–1914, and a summary of the crop production through the same period.

**Select list of references on economic reconstruction, including reports of the British Ministry of Reconstruction**, H. H. B. Meyer (*Washington: Libr. Cong.* [*U. S.*], *1919, pp. 47*).—A list of selected books, in English and French, on economic reconstruction, including some relating to agriculture and food supplies.

**The country church in the new world order**, E. Des. Brunner (*New York: Assoc. Press, 1919, pp. XI+164*).—Examples are given of the success of country churches in meeting war problems in their respective communities, and their functions and responsibility in reconstruction are forecasted.

**The problem of land ownership: A proposal for its rational solution**, P. Balinsky (*New York:* [*Author*], *1919, pp. 96, pls. 7*).—A project is advanced which includes purchase by the Government of all the land, its resale by lots, and the organization of four departments under a central institution which shall administer and guarantee to farmers all the benefits of modern science and culture.

**Farm tenantry in Nebraska compared with farm ownership**, H. Kano (*Thesis, Univ. Nebr., 1918, pp. 42, pls. 2, figs. 2*).—Fifty-one individual farm records taken in Thurston County, 52 in Seward County, and 55 in Gage County, Nebr., were used as the basis for this study. Those from Thurston were classified as owned, part owned, share-cash rented, and cash rented; those from the other two counties as owned, part owned, and share-cash rented, giving a total of 10 groups in the three counties. The various items recorded in the records of the group were totaled and then averaged, reducing each of the 10 tenure groups to an average one-record basis.

**The foundations of society and the land**, J. W. Jeudwine (*London: Williams & Norgate, 1918, pp. XXVIII+514, pl. 1, fig. 1*).—The account of the communal society by Tacitus in his Germania, Ancient Laws of England, Ireland, and Wales, Year Books of Edward I, II, and III, Scandinavian sagas, and numerous ancient and recent official and personal records furnished the basis of this study of beginnings of agriculture in Great Britain and Ireland, transition to the feudal system, holding and transfer of land in mediæval society, alienation and inheritance, uses of waste land and forest under both communal and feudal systems, and inclosures. Much purely historical matter is treated from the author's point of view of the social as opposed to the constitutional historian to show the agricultural and economic ruin of Ireland and Scotland.

**The minimum wage on light land** (*Country Life [London], 45 (1919), No. 1168, p. 584*).—There is summarized here a report by representative farmers and land owners on agricultural problems in connection with the light land of Norfolk, England, and the form of Government aid required there.

**Agricultural wages in Ireland** (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 8 (1919), No. 6, pp. 180, 181*).—Data relating to the fixed minimum weekly rate of wages are given, as tabulated in a report from the United States consul at Dublin.

**French farm loans** (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 8 (1919), No. 3, pp. 56, 57*).—A brief note on the assistance rendered, through various State and private agencies, to French agriculturists returning to abandoned farms.

**Report of the proceedings of the first American Cooperative Convention, Springfield, Ill., 1918** (*Rpt. Proc. Amer. Coop. Conv., 1 (1918), pp. 264*).—Addresses and discussions on cooperation among farmers, heard at the first American Cooperative Convention, at Springfield, Ill., September 25–27, 1918, under the auspices of The Cooperative League of America, are included here.

**Introductory address of [United States wheat director] to grain trade conference, held in New York, June 10–11, 1919,** J. H. BARNES (*New York: Chamber Com., 1919, pp. 21*).—The speaker describes the destroyed economic existence of some of the nations of Europe, and the ways in which their needs have been supplied by the U. S. Grain Corporation in cooperation with private and Government agencies. In outlining future policies for the handling of our share of the bread-grain supplies of the world, he urges that the Government pledge to the grower be kept but without profiteering out of the needs of Europe. He favors exportation of grain rather than of the milled product, in order to relieve unemployment in Europe.

**Final report of the Royal Commission on the natural resources, trade, and legislation of certain portions of His Majesty's dominions,** D'ABERNON ET AL. (*Final Rpt. [Dominions] Roy. Com. [London] Nat. Resources, Trade and Leg. [etc.], 1917, pp. IX+199, pl. 1*).—Among the topics reported upon here are the agricultural and pastoral resources of the five British self-governing dominions (Canada, Australia, New Zealand, Union of South Africa, and Newfoundland), control of food supplies during the war, organization for scientific research in relation to the development of the natural resources of these regions, and the marketing of products. The commission recommends surveys relative to Empire requirements and Empire production, research and institutions in the dominions, and improvement of imperial communications and commercial practices.

**Prices and supplies of corn, live stock, and other agricultural produce in England and Wales** (*Bd. Agr. and Fisheries [London], Agr. Statis., 52 (1917), No. 3, pp. 59–90*).—This bulletin continues information previously noted (E. S. R., 38, p. 495), by adding statistics for 1917.

**[Exports and imports of French agricultural products],** J. M. DE LAGORSSE ET AL. (*Cong. Nat. Export. et Import. Prod. Agr., Compt. Rend. Trav., 1913, pp. 230, pl. 1, figs. 5*).—This embodies reports made to meetings of the National Congress of Exports and Imports of Agricultural Products held at Paris, February 18–20, 1913, relating to production and movements of cereals, live stock, wines, fruits, and other crops in France, her colonies, and a few foreign countries.

**Agricultural and live stock statistics of Finland** (*Statis. Årsbok Finland, n. ser., 15 (1917), pp. 124–196*).—This volume continues information previously noted (E. S. R., 40, p. 392).

**Statistics of industrial crops,** V. PEGLION (*Comitato Naz. Tariffe Dog. e Trattati Com., Monograph 6 (1917), pp. 171*).—Statistics and notes on the pro-

duction, trade, and tariff regulations of certain industrial crops, such as hemp, jute, flax, and sugar beets in Italy.

**Economic and financial resources of Russia, by regions and by governments** (*Bul. Statis. Lég. Compar., 42 (1918), No. 8, pp. 304–325*).—Two tables showing the area, population, agriculture, industry, and means of communication, and the finances of Russia, by regions and by governments, are reproduced here from a Statistical Outline of the Economic Geography of Russia, published recently by the Paris Chamber of Russian Commerce.

**The agricultural resources of Morocco**, M. Hitier (*Bul. Soc. Encour. Indus. Nat. [Paris], 118 (1919), I, No. 2, pp. 348–363*).—Brief descriptions of the principal agricultural products of Morocco and a discussion of the possibility of developing new crops there are given.

**Prices and wages in India** (*Dept. Statis. India, Prices and Wages India, 33 (1918), pp. IX+278, pl. 3*).—This continues information previously noted (E. S. R., 37, p. 792.

## AGRICULTURAL EDUCATION.

**American agricultural colleges: A study of their organization and their requirements for admission and graduation**, C. D. Jarvis (*U. S. Bur. Ed. Bul. 29 (1918), pp. 125, figs. 4*).—Part 1 of this bulletin comprises general discussions and tabulations concerning the government and organization and the agricultural curricula of each of the agricultural colleges in this country. Parts 2 and 3 deal respectively with the requirements for admission and graduation. Tabulated outlines, showing the scope and credit value of the graduation requirements for the several institutions, are appended.

The following principles are suggested concerning scholastic requirements for admission: The colleges should exert an influence upon improved secondary schools in such a way as to enable them to prepare adequately students for colleges and to maintain their usefulness for the mass of students who may never enter college. Work should be prescribed by the colleges only in such preparatory subjects as are regarded as prerequisite to the freshman work in the college curriculum for which the applicant seeks admission; it being understood that the colleges, in accrediting or passing upon the qualifications of high schools, have an opportunity for prescribing the general qualifications for their prospective students. For the guidance of prospective candidates for the degree of bachelor of science in agriculture, each State should publish a statement showing what are believed to be appropriate sequences of studies and an acceptable amount of coordinated work covering the combined high school and college periods.

Special attention is called to the necessity for a more uniform basis for college credit. The lack of such uniformity renders difficult the comparison of institutions from the standpoint of the amount of work required for graduation, and interferes with the free and just exchange of credit for work done in two or more institutions.

The great variation among institutions in their quantitative requirements for graduation indicates either a great waste of time in some institutions, or a sacrifice of quality of work for quantity in others. The wide difference of practice in regard to the relative proportion of prescribed and elective work offered by the institutions shows that the question of freedom of election is still a matter of contention.

The most conspicuous disagreement in the placement of courses within the 4-year schedule is the tendency on the part of some colleges to defer the offering of strictly agricultural courses until the sophomore or even the junior year, while others require such work from the very beginning of the course.

There is a growing belief that more technical work should be given early in the curriculum. That some institutions, in making up their schedules, apparently give more attention to classroom and laboratory facilities and to the convenience of instructors than to a careful balancing of the student's work would appear to be indicated by the uneven distribution in the curriculum of the heavy science courses. A lack of a clear conception of what should be required for the bachelor's degree in agriculture is suggested by the variation in content of the curriculum.

The great variation in the distribution of the required work among the various groups or classes of subjects suggests a divergence of views concerning educational aims. There is a tendency among certain institutions during recent years to emphasize the economic and sociological phases of the training, while others place the emphasis upon technical efficiency. The danger lies in the failure to adapt college curricula to the ever-changing economic conditions.

It is found that in only a few States is any conspicuous attempt being made to consolidate the curricula of the elementary and preparatory schools with the curriculum of the college in such a way as to suggest appropriate sequences embracing the whole period of training for professional agriculture. Such a consolidation contemplates a single and complete program of instruction covering a period of approximately 10 years instead of two or three quite distinct programs of shorter duration.

Many colleges still fail to appreciate the importance of requiring a fair degree of proficiency in practical farm operations.

**Report of the education branch for the year 1916–17** (*Jour. Bd. Agr.* [*London*], *25* (*1918*), *No. 8, pp. 934–941*).—This is the annual report of the British Board of Agriculture and Fisheries, dealing with the educational, research, and advisory work of the various institutions and local education authorities for 1916–17, as well as with the payment of grants during the fiscal year ended March 31, 1917.

Grants paid to institutions providing higher agricultural education have been reduced or withdrawn in certain cases. The Holmes Chapel College, Cheshire, was closed on account of the war, while the Seale-Hayne College, Newton Abbott, received a grant of $972 for the equipment of the college farm when the institution was opened for the training of women for work on the land. The college buildings, the completion of which had to be suspended after the outbreak of the war, were taken over by the war office as a military hospital, as were also the new buildings of the Midland Agricultural and Dairy College at Sutton Bonington. The attendance of students for long courses at the higher agricultural education institution (348) showed a further material decrease from prewar standards (1,200). The agricultural activities of the county councils were again directed mainly toward war problems.

The total of the grants made by the board for 1916–17, which was $370,220, included $58,125 for universities and colleges, $33,111 for advisory work, $87,553 for research institutes and other research centers, $36,304 for special research and investigations, $3,198 for research scholarships, $127,434 for farm schools, technical classes, local lectures, etc., $7,650 for the establishment of farm schools, $4,447 for expenses of advisory councils, and $12,398 for forestry advice, research, and experiments.

**Report of the Direction of Agriculture for 1917** (*Dept. Landb., Nijv. en Handel* [*Netherlands*], *Verslag Dir. Landb., 1917, pp. VII+77*).—This is a report on the status of higher, secondary, and elementary instruction in agriculture, horticulture, and forestry, instruction in home economics, veterinary science and dairying, and extension and experimental work under the Direction of Agriculture in the Netherlands in 1917.

**Report of the Department of Agriculture of Norway for 1917** (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1917, III, Statsforanst., pp. [5]+5+V–XCVIII+711, pls. 3, figs. 58*).—This is the annual report for 1917 on the activities of the various government agencies for the promotion of agriculture in Norway, including chemical, seed, and milk control stations, experimental farms, sheep farms, dairy and horticultural schools, the school of home economics for training teachers, itinerant instructors, etc.

**Report of the Department of Agriculture of Sweden, 1916** (*K. Lantbr. Styr. [Sweden] Underdåniga Ber. 1916, pp. [10]+783+X, fig. 1*).—This is the annual report on the activities of the various agencies for the promotion of Swedish agriculture, including the work of agricultural, horticultural, dairy, and housekeeping schools, dairy, chemical, and seed control stations, and the extension service.

**Ninth annual report of the eleven district agricultural schools of Georgia**, J. S. STEWART (*Ga. State Col. Agr., Bul. 155 (1918), pp. 40, fig. 1*).—This report contains the organization lists of these schools; statements of improvements in the school plants during 1917–18, of extension work, including home projects cooperation with the Georgia State College of Agriculture, of teacher training at the various schools, special features of the year, and recommendations, war work, and physical training; an outline of the course of study in operation; an outline of the revised course adopted for 1918–19 to meet the provisions of the Smith-Hughes Act, with a schedule of hours and explanatory notes; the text of the legislative act creating the schools; and statistics of attendance, equipment, receipts, and disbursements, etc.

It is shown that for individual schools, the total attendance ranged from 72 to 211 students, the total number of acres cultivated from 75 to 257, the value of live stock from $1,695 to $6,600, the value of farm stock from $500 to $4,000, the State appropriation from $14,000 to $17,000, the total receipts from $14,496 to $25,812, and the total disbursements from $13,347 to $26,301.

**The Gary public schools: Household arts**, E. W. WHITE (*New York: Gen. Ed. Bd., 1918, pp. XIX+49, pls. 7, figs. 2*).—This is a report on the instruction in cooking and sewing in the Gary (Ind.) public schools, including time schedules and enrollment, the cafeteria, equipment, staff and instruction, tests, and a discussion of the merits and defects of the instruction.

In concluding, the author states that this account may mislead because it fails to give a proper realization of the attitude and spirit of the Gary pupils. These pupils are happy, and in the author's judgment "the happiness and spontaneity of the children are due to a variety of causes—to the flexibility of the schedule, to the development of special activities, to the absence of repressive rules, to the general feeling that the school exists for the child, not the child for the school."

**Domestic science in rural school** (*Agr. Gaz. Canada, 6 (1919), No. 1, pp. 51–60, figs. 3*).—This is a series of brief accounts, by education officials, of the present status of instruction in domestic science in the rural schools of the Provinces of Nova Scotia, New Brunswick, Quebec, Saskatchewan, Alberta, and British Columbia. These indicate that domestic science is a comparatively new subject in the rural schools of these Provinces, in three of which it is aided by government grants. In four of the Provinces the hot school lunch has been introduced into the rural schools.

**Report Wellesley College training camp and experiment station for the Woman's Land Army of America**, E. DIEHL ([*Wellesley, Mass.: Wellesley Col.*], *1919, 2. ed., pp. 95, figs. 10*).—This is a report, by the camp director, on the organization and activities of the training camp and experiment station which was opened August 1, 1918, with 32 women. Outlines of courses for

supervisors; a course in emergency aid, hygiene, and sanitation; and specifications, together with estimates of material and cost of camp buildings for a camp of from 30 to 40 women; lists of equipment with cost, and of camp menus, etc., are included.

**[Opportunities in agriculture for disabled soldiers, sailors, and marines]** (*Fed. Bd. Vocat. Ed., Rehabil. Ser., 1919, Nos. 33, pp. 20, figs. 12; 36, pp. 20, figs. 20; 37, pp. 31, figs. 28*).—These bulletins outline the opportunities in Technical Agriculture as a Vocation, by W. J. Quick; Farm Mechanics from Tank or Truck to Tractor, by J. H. Gill and W. J. Quick; and Beekeeping, by W. J. Quick, respectively, to disabled soldiers, sailors, and marines in choosing a vocation.

**Vocational legislation passed at the 1919 session of Arizona State Legislature and a statement of requirements and qualifications to secure State and Federal aid** (*Bul. State Bd. Control Vocat. Ed.* [*Ariz.*], *No. 3* (*1919*), *pp. 15*).—Under this legislation the State undertakes to reimburse for 75 per cent of the expenditures for salaries of teachers of vocational subjects, provided the Smith-Hughes requirements which are set forth in this bulletin are met. In a course in vocational agriculture, half of the school day must be devoted to agricultural subjects, of which 90 minutes a day must be given to supervised practical work. The texts of the two State legislative acts of 1919 are included.

**[Vocational home economics education in California]**, M. I. Murchie (*Cal. State Bd. Ed., Dept. Vocat. Ed., Ext. Serv. Teachers Home Econ., Corresp. Nos. 1* (*1919*), *pp. 4; 2, pp. 3; 3, pp. 2; 5, pp. 3*).—These pamphlets deal respectively with home economics education as outlined in Bulletin No. 23 (E. S. R., 40, p. 394); vocational courses of study for Federal and State aided full-time classes in home economics in high or intermediate schools; progress in home economics education in California; and the organization of part-time classes in home economics.

**First annual report of the Colorado State Board for Vocational Education** (*Ann. Rpt. Colo. State Bd. Vocat. Ed., 1* (*1918*), *pp. 23, figs. 8*).—This is a report for the first fiscal year under the Smith-Hughes Act.

Of the total Federal funds, amounting to $15,000, available for this work, $5,000 was devoted to the teaching of agriculture, $1,000 to the teaching of home economics, and $5,000 to the training of teachers, viz, $1,000 each for the training of agricultural and trade teachers, and $3,000 for the training of home economics teachers. Practically all of the expenses for the administration of the act were met out of the maintenance funds of the Colorado Agricultural College, local school districts, and other cooperative agencies.

The agricultural project work was engaged in by 125 students and ranged from raising a garden to many acres of farm crops. Potato, poultry, and tractor projects are outlined to indicate how the work was conducted. All home economics funds were used to promote the teaching of home economics classes in consolidated rural schools, of which two were aided, and the plans for 1918–19 provide for a continuance of this practice.

The training of teachers of vocational agriculture and home economics was done at the Colorado Agricultural College, the students receiving actual teaching experience in these subjects in the Colorado School of Agriculture, located on the college campus.

**The administration of the Smith-Hughes vocational act in Georgia for the first year, July 1, 1917, to July 1, 1918** (*Ga. State Vocat. Bd.* [*Bul.*], *3* [*1918*], *pp. 37*).—This review of vocational education work under the Smith-Hughes Act for 1917–18 in Georgia includes a brief resumé of the work in each of the schools receiving aid under this act.

It was necessary to rearrange the schedule of the 11 district agricultural schools to give 50 per cent of the time to agriculture.

Teacher training for vocational agriculture was organized at the university at the beginning of the second term in 1917. A new division of agricultural education was established in the Georgia State College of Agriculture. The courses given in this division were supplemented by training in pedagogy and social sciences given in the Peabody School of Education, while the scientific and humanistic courses were given in connection with the regularly organized courses in the university. A 3-months war emergency course was also introduced by the college of agriculture to meet the shortage of available men for teachers. Teacher training in home economics was offered at the State Normal School at Athens and the State Normal and Industrial College at Milledgeville, and was begun in the South Georgia Normal School at Valdosta.

**First annual report of the Massachusetts Board for Vocational Education to the Federal Board for Vocational Education** (*Bul. Bd. Ed. Mass., No. 11 (1918), pp. 160, figs. 4*).—This report comprises a brief description of the vocational education work carried on in Massachusetts in 1917–18 under the Smith-Hughes Act, a financial summary of receipts and expenditures of vocational education funds, and a statistical report. These are followed by appendixes, including among others detailed reports on the agricultural work by R. W. Stimson, household arts schools by L. I. Pryor, and plans for agricultural teacher training by W. R. Hart and F. E. Heald, and statistical tables showing the distribution and allotments of benefits from the Smith-Hughes Act, forms of application for allotments, administrative regulations, the text of the State laws relating to the extension of State aided vocational education during the period of the war, and the training and instruction of disabled soldiers and sailors by the Commonwealth and the Federal Government, etc.

The State Board for Vocational Education approved four separate schools and 10 high school departments for vocational agricultural instruction, and nine all-day and 19 evening schools for vocational home economics instruction. Notes are included on the work of each of these approved schools and departments, including war emergency work. A plan recommended for the training of teachers of vocational agriculture is set forth, as well as outlines of several other training courses.

**Annual report of the State Board for Vocational Education for the year ending June 30, 1918** (*State Bd. Control Vocat. Ed. [Mich.], Vocat. Ed. Bul. 209 (1918), pp. 10*).—This first report of the Michigan State Board for Vocational Education contains a digest of the State law accepting the provisions of the Smith-Hughes Act, the procedure in the organization of the work, and financial and statistical statements.

The total disbursements from local, State, and Federal funds included $661.13 for a supervisor of agriculture, $46,441 for salaries of teachers of agriculture, $7,157.36 for teacher training in agriculture and home economics at the Michigan Agricultural College, and $5,077.97 for teacher training in home economics at the State Normal College. The disbursements of Federal and State funds for home economics amounted to $4,706.67.

There were 43 schools teaching agriculture aided by Federal and State funds, with an enrollment of 2,535 students in these subjects. Five all-day home economics schools were attended by 387 students, and four evening home economics schools by 894 students. Eight schools received Federal and State aid for instruction in home economics. Training courses in agriculture and home economics were attended by 45 and 81 teachers, respectively.

**Report on vocational education for Montana for the year 1917–18.** M. J. ABBEY (*Rpt. Vocat. Ed. Mont., 1917–18, pp. 14*).—This first report on vocational education in Montana contains digests of the Smith-Hughes Act and the State act accepting its provisions and appropriating $15,000 for the years 1918 and 1919, respectively, and an account of the organization of the work.

Eight high schools were approved for State and Federal aid for vocational agriculture and three for home economics. The Montana State College of Agriculture and Mechanic Arts was selected to train teachers of vocational subjects. At present 28 men are preparing to teach agriculture and 16 women to teach home economics.

**Plans for vocational education in Nevada under the Smith-Hughes Act, year 1919–1920** (*State Dept. Ed. Nev. Bul. 3 (1919), pp. 15*).—This bulletin contains in brief form and in part the State plans for vocational education for the year 1919–20, which supersede those previously noted (E. S. R., 40, p. 597).

**Vocational education laws in Nevada appertaining to the Smith-Hughes Act for years 1919–1920** (*State Dept. Ed. Nev. Bul. 4 (1919), pp. 16*).—This bulletin is intended specifically for use in the resident teacher-training classes at the University of Nevada and for itinerant teacher-training throughout the State. It includes an analysis of the Smith-Hughes Act.

**Federal aid for vocational education in North Carolina under the Smith-Hughes law** (*Bul. State Bd. Vocat. Ed. N. C., No. 2 (1918), pp. 40*).—Part I of this bulletin contains an outline of the plans for 1918–19 for vocational education in North Carolina under the Smith-Hughes Act.

The North Carolina State College of Agriculture and Engineering has been designated as the institution for training white teachers for vocational agriculture; The Negro Agricultural and Technical College at Greensboro, for training negro teachers of vocational agriculture; The North Carolina State Normal and Industrial College at Greensboro, for training teachers of vocational home economics for the white race; and the Slater Industrial and State Normal School at Winston-Salem, for the training of teachers of vocational home economics for the colored race. It is proposed to use $3,000 of the funds for teacher training work in training teachers of agriculture for the white race and $1,000 for the colored race, while for home economics the respective allotments are $4,000 and $1,000.

The teacher-training course in agriculture for white students extends over four years. Students are required to complete 190 hours for graduation, of which 18 are in education. Forty per cent of the students' time must be devoted to technical subjects, 30 per cent to science, 10 per cent to professional subjects, including practice teaching, and 20 per cent to general education subjects. It has been arranged to use the Carey farm-life school as a practice and observation school.

The 4-year course for the training of home economics teachers comprises 61 unit hours. Thirty per cent of the time in this course must be devoted to home economics subjects, 30 per cent to related science, 30 per cent to academic subjects, and 10 per cent to professional education, including practice teaching and observation.

Outlines of a suggested 4-year course for vocational schools in agriculture, with at least 50 per cent of the students' time devoted to vocational work, and a 2-year course in home economics, in which a 90-minute period each day is devoted to practical work and a 60-minute period to related subject work in science, are included.

Part II contains financial and statistical reports of the State Board for Vocational Education for the fiscal year 1917–18.

**Vocational education: Plan of the State Board for Vocational Education** (*Bul. State Bd. Ed.* [*Va.*], *1* (*1918*), *No. 1, Sup. 2, pp. 29*).—Under approved plans, 18 or 20 high schools are operating departments of vocational education in agriculture and home economics. The State Board of Education, which has been designated as the State Board for Vocational Education, has apportioned 45 per cent of the teacher-training fund for 1918–19 for the training of teachers, supervisors, or directors of agriculture and 30 per cent for the training of teachers of home economics.

The 4-year course in vocational agriculture, including suggestions for project work, is outlined. The first year is devoted to plant production, the second to animal production, the third to general horticulture and field crops, and the fourth to rural engineering and farm mechanics in the first term and rural economics and farm management in the second term. Outlines are also given of a suggestive millinery course, a 2-year course in home economics proposed for cities with a population of over 25,000, and a 4-year course for cities, towns, and communities of less than 25,000 inhabitants.

**Courses of study in vocational agriculture and vocational home economics,** J. D. Elliff (*Missouri State Bd. Ed., Vocat. Ed. Bul. 3* (*1918–19*), *pp. 45*).—This bulletin contains outlines of the first-year course in vocational agriculture; a suggested curriculum in vocational home economics showing the distribution of time by years, terms, and weeks; courses in drawing and design; garment making, including textile work; food study and home cooking; housekeeping, planning and serving meals, household accounts, and household management; physiology, hygiene, and home nursing; elementary dressmaking and millinery; references to helpful literature on agriculture and home economics; laboratory exercise in agriculture; a suggested list of agricultural home projects; and suggested projects in home economics.

The Missouri plan for vocational instruction in agriculture for 1918–19 provides for two years' continuous instruction. The first year of the agricultural course requires one-half of the student's time and deals with soils, soil fertility, farm crops, farm animals, farm management, and farm mechanics. The second year's work will consist of two of the intensive courses in soils, horticulture, farm crops, and animal husbandry.

**Brief description of a plan for unit and short courses in vocational agriculture: Unit plan for high schools,** T. H. Eaton (*State Bd. Ed. Conn. Bul. 37* (*1918–19*), *pp. 7*).—A plan is described opening up to high schools and to students opportunities for one and two or four years of work, and to the community the possibilities of short-course instruction for pupils not in the high school or in any school at all, and for adults.

**Making lessons in agriculture count,** J. F. Shambaugh (*Bul. Teaching Agr.* [*Off. Supt. Pub. Instr., N. C.*], *No. 1* (*1917*), *pp. 16*).—These lessons suggest methods of teaching agriculture and are based on the text, Agriculture for Beginners (E. S. R., 16, p. 832), adopted for the North Carolina public schools.

**Vocational agricultural education by home projects,** R. W. Stimson (*New York: The Macmillan Co., 1919, pp. XXXVIII+[2]+468, figs. 304*).—This is a detailed review of the Massachusetts home-project plan, which meets the minimum requirements of the Smith-Hughes Act of at least six months a year of supervised practice in agriculture. It includes a brief reference to the various forms of organization of secondary vocational agricultural education; discussions of the home project school or department *v.* the self-contained school; project study *v.* subject study; vegetable growing project study outlines in Massachusetts; suggestions to supervisors, superintendents, and directors, supported by experience in Massachusetts, regarding certain principles of pro-

cedure which the author believes to be of importance for the advancement of vocational agricultural education; and suggestions to agricultural instructors on organizing and conducting project work. A comparison is made of the county schools and high-school departments in the Massachusetts no-dormitory system as to requirements and advantages. A chapter is devoted to a description of the Massachusetts method of listing agricultural project and related study reference materials and their sources.

**Agriculture and home economics bulletin with a moral code**, R. H. WILSON ET AL. (*Oklahoma City: State Bd. Ed., 1917, pp. 48, figs. 11*).—A 2-year course in agriculture for the rural schools of Oklahoma is outlined by months, including class work, field or laboratory work, and mechanical work in soils and crops in the first year, and animal husbandry in the second year. Instructions to teachers are included. The home economics work outlined is for the sixth, seventh, and eighth grades of the rural schools. The work of the first year consists entirely of sewing, and that of the second and third years, of foods. The work is planned for one lesson a week for 30 weeks in class periods of not less than 30 minutes.

**[Elementary agriculture and home economics instruction in New Mexico schools]**, R. C. MILLER (*Dept. Ed. N. Mex., Ed. Bul., Indus. Ser., 1918, Nos. 3, pp. 14; 4, pp. 6, figs. 2; 5, pp. 8; 1919, Nos. 6, pp. 24; 9, pp. 16; 10, pp. 14; 11, pp. 16*).—These bulletins deal, respectively, with thrift clubs for patriotic service in food production, a project for classes in sewing, agriculture in the elementary schools, and elementary home projects in gardens, pig raising, calf raising, and field crops.

**Plant production**, R. A. MOORE and C. P. HALLIGAN (*New York: American Book Co., 1919, pp. 428, figs. 211*).—This text on the science and art of producing agricultural plants consists of two parts, viz, agronomy, including the more important economic crops, and horticulture. Following each chapter are suggested exercises and home projects.

**Vocational agriculture in high schools: Animal husbandry series No. 2**, T. H. EATON and C. E. LEE (*State Bd. Ed. Conn. Bul. 20 (1918–19), pp. 23*).—Suggestions are given with reference to the teaching of poultry husbandry in the approved course in agriculture as regards the place of poultry husbandry in the course; a preliminary survey to find the place of poultry keeping as a farm interest in the vicinity; surveys of types of poultry husbandry to find the chief factors in the business; local feeding practices and available feeds, poultry houses and arrangements, and feeding and watering devices; marketing poultry products; and incubating and brooding equipment. A brief list of reference books and other publications is included.

**Malaria: Lessons on its cause and prevention**, H. R. CARTER (*Pub. Health Rpts. [U. S.], Sup. 18 (1918), rev. ed., pp. 20, pls. 4*).—These lessons, which are intended for the use of schools and especially those in the country, deal with malarial fever and its cause and four methods of prevention of malaria. The subject matter is arranged as questions and answers.

**Distribution of eggs to school children** (*Agr. Gaz. Canada, 6 (1919), No. 3, pp. 274–278*).—This series of articles describes the methods of distribution of eggs to school children in the Provinces of Nova Scotia, New Brunswick, Quebec, Manitoba, Saskatchewan, Alberta, and British Columbia by agricultural officials.

**Domestic science: Principles and application**, P. L. BAILEY (*St. Paul, Minn.: Webb Pub. Co., 1918 [2.] ed., rev., pp. XVI+353+[13], pl. 1, figs. 44*).—This is a revised edition of an earlier text, previously noted (E. S. R., 32, p. 394), to which has been added material on the cold-pack method of canning vegetables and fruits, 100 caloric portions of common foods, and tables and lists of foods

with their ash constituents, together with many changes in the recipes to conform to the more thorough application of the principles involved and to the unusual economic food conditions prevailing.

## MISCELLANEOUS.

**Annual Reports of the Department of Agriculture, 1918** (*U. S. Dept. Agr. Rpts. 1918, pp. VII+520*).—This contains the reports of the Secretary and heads of bureaus and other administrative officers. The various reports are also issued as separates.

**Annual report of the director of the experiment station on work done under the Local Experiment Law in 1918,** J. F. Duggar (*Alabama Col. Sta. Circ. 40 (1919), pp. 54*).—This includes a summarized report by the director of work in all departments conducted under this law (E. S. R., 24, p. 400) for 1918, a financial statement for the year, and detailed reports of heads of departments, including reports on boys' and girls' club work and other extension activities. Experimental work in beef cattle and pig feeding is abstracted on pages 368 and 369 of this issue.

**Twenty-eighth Annual Report of Arizona Station, 1917** (*Arizona Sta. Rpt. 1917, pp. 387–498, figs. 17*).—This contains the organization list, an administrative report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1917, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue. A brief report on the work and expenditures of the college of agriculture is appended.

**Director's report for 1918,** W. H. Jordan (*New York State Sta. Bul. 457 (1918), pp. 25*).—This contains the organization list and a review of the work and publications of the station during the year.

**Twenty-eighth Annual Report of Wyoming Station, 1918** (*Wyoming Sta. Rpt. 1918, pp. 65–127*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1918, reports of the director and heads of departments, and meterological observations and two special articles abstracted elsewhere in this issue.

**Quarterly bulletin of the Michigan Experiment Station** (*Michigan Sta. Quart. Bul., 1 (1919), No. 4, pp. 149–196, figs. 18*).—In addition to the usual list of available bulletins, this contains the following articles: Diversified Farming after the War; The Pure-bred Sire Campaign; Grading of Milk by Microscopic Examination, by G. L. A. Ruehle; Legume Inoculation, by C. G. Nobles; Botanical Notes, by G. H. Coons; Analyses of Insecticides and Fungicides, by A. J. Patten; Machine *v.* Hand Milking, by F. T. Riddell (see p. 373); The College Jerseys, by J. E. Burnett; Ox Warbles, by W. L. Chandler; Periodical Cicada, by R. H. Pettit; Sorghum Sirup Production, by C. R. Megee; Meeting the Hay Shortage, by J F. Cox; Robust Beans, by F. A. Spragg; Care of the Tractor and Splicing the Hay Rope, both by H. H. Musselman; Preservative Treatment of Fence Posts, by A. K. Chittenden; Thinning the Wood Lot, by F. H. Sanford; Horticultural Notes, by H. J. Eustace; Cooperative Experimental Soil Projects, by M. M. McCool; Culling the Farm Flock, by C. H. Burgess; and Control and Eradication of Rats, by A. C. Conger.

# NOTES.

**Connecticut State Station.**—Philip Garman, Ph. D., assistant entomologist at the Maryland Station, has been appointed assistant entomologist.

**Georgia Station.**—An approximately 30 per cent increase in enrollment for all courses over last year is predicted. The total enrollment in agriculture will be approximately 400. The college became co-educational last year, and now has approximately 40 women taking courses in home economics. A three-story dormitory for women is under construction.

A series of land clearing demonstrations has been undertaken in 18 south Georgia counties. In one of these counties 69,428 of the 87,428 acres of land under cultivation are filled with stumps which are estimated to take up an average of approximately 13.6 sq. ft. per stump, so that the question of land clearing is one of great importance. The demonstrations consist of stump pulling and blasting, ditch blasting, and work with tractors. At the first six demonstrations there was a total attendance of 13,500 people, as many as eight counties being represented at some of them. The campaign has attracted unusual notice from the press of the State.

**Iowa College and Station.**—Dr. R. E. Buchanan, head of the department of bacteriology and for six years dean of the division of industrial science, has been made dean of the graduate school. He has been succeeded by Dr. S. W. Beyer, for nineteen years vice dean and for the war period dean of the engineering division.

**Massachusetts College and Station.**—A campaign is under way to raise $150,000 from the alumni and undergraduates with which to build and equip a students' activities building. This building is designed to be a memorial to the 49 graduates and former students who lost their lives in the war.

Dr. J. K. Shaw, research pomologist of the station, has resigned effective November 1, to become head of the department of horticulture at the University of West Virginia. John B. Smith, assistant chemist, has accepted a similar position with the Texas Station.

F. A. Waugh and G. Edward Gage, captains in the Sanitary Corps, have resumed their former duties in the college and station. W. S. Welles, head of the school of educational agriculture at the River Falls (Wis.) Normal School, has been appointed professor of agricultural education.

**Montana College and Station.**—C. N. Arnett, head of the animal husbandry department, has resigned effective November 1 to become manager of a large stock ranch in the State. Ray S. Jones, assistant chemist of the station, returned from war service September 1.

**New Mexico Station.**—A number of native goats have been purchased to start the investigations contemplated on the improvement of the native strain for milking purposes by crossing with the Toggenburg breed.

Charles E. Cormany and Gates S. Vickers, assistants, respectively, in agronomy and poultry husbandry, have resigned to engage in graduate work at Cornell University. Donaldson Ryder and R. M. Parks have been appointed to succeed them. Cleave W. Humble, assistant animal husbandman, has resigned to engage in commercial work and has been succeeded by J. L. Lantow.

**North Dakota College and Station.**—Three members of the staff have recently resigned, including J. W. Ince, as chemist in the station to become professor of chemistry in the Rhode Island College; T. A. Hoverstad, in charge of marketing investigations, to engage in business; and Edwin Mayland, in charge of cost accounting investigations in the station, to accept a position as farm manager.

**Tennessee University.**—A department of agricultural economics has been established in the college of agriculture with C. E. Allred, formerly farm help specialist, as head. All work in agricultural economics, farm management, and rural sociology is to be grouped in this department, and considerable research work is contemplated.

**Texas College and Station.**—The legislature just adjourned appropriated slightly over $3,000,000 for the college and its branches for the next two years. Of this, $2,244,985 was for the main institution at College Station, including the extension service and station, and with $250,000 for an agricultural building. The John Tarleton Agricultural College at Stephenville received $184,490, the Grubbs Vocational College at Arlington $235,800, and the Prairie View Normal and Industrial College $397,070.

Plans have been completed for an office building for the extension service of the college to cost $100,000.

**Virginia Station.**—T. K. Wolfe, associate agronomist, has been granted leave of absence beginning October 1 to pursue graduate studies at Cornell University. His duties have been assigned to J. C. Hart, superintendent of the county station at Chatham, while D. J. Berger has been appointed acting superintendent of that station. C. F. Warren, assistant horticulturist, resigned September 16.

**Wyoming University and Station.**—C. V. Singleton has resigned as assistant animal husbandman to engage in farming in Virginia. Dr. F. A. Hays, for the past two years head of the animal husbandry department at the Delaware College and Station, has been appointed associate professor of animal husbandry beginning September 1.

Karl Steik, engineering chemist, has resumed station work after a year's leave of absence.

**Research in Entomology and Plant Pathology in Great Britain.**—Announcement was recently made in Parliament of a change in policy in 1918 regarding research in entomology and plant pathology through public funds. These subjects were originally allocated to the University of Manchester and the Royal Botanic Garden at Kew, respectively, with grants from the Development Fund for their support. In 1918, however, the Development Board decided that all research in plant diseases, whether due to insects or fungi, should be concentrated at a single phytopathological institute at Rothamsted, where also the board's scientific advisory staff in the subject would be stationed. Accordingly the staff at Manchester and a portion of the mycological staff at Kew were transferred to Rothamsted. A grant of $5,000, per annum, was however continued to the University of Manchester to maintain certain phases of its entomological work and also to take up work in mycology there.

**American Meteorological Society.**—According to a note in *Science*, steps are being taken to organize an American Meteorological Society at the American Association for the Advancement of Science meeting in St. Louis next December.

**International Research Council.**—This organization met at Brussels from July 18–28. A general constitution was agreed upon, and steps taken toward the international organization of several of the sciences represented. Provision was made for triennial meetings at Brussels, which was designated as the legal

domicile of the council. A resolution inviting the cooperation of nations which had remained neutral during the war was unanimously adopted.

**Union Check List of Agricultural Periodicals.**—At the last meeting of the Agricultural Libraries Section of the American Library Association, held at Asbury Park, N. J., June 26, the subject of preparing a union check list of agricultural periodicals in the libraries of the United States received special consideration and indorsement. A committee consisting of C. R. Green of the Massachusetts Agricultural College, H. O. Severance of the University of Missouri, and Miss Lydia K. Wilkins of the U. S. Department of Agriculture was appointed to decide as to the scope of such a list and the methods to be undertaken in its compilation.

**Necrology.**—Dr. Emil Fischer, professor of chemistry at the University of Berlin since 1892 and one of the most eminent organic chemists of his generation, died in July at the age of 67 years. Among his many epoch-making achievements may be cited his discovery of phenylhydrazine in 1875, the synthesis of the most important sugars, his notable work on the enzyms and purin group, and the hydrolysis and synthesis of the proteins. He was the recipient of many honors, including the Nobel prize in chemistry in 1902. His researches were compiled and published in book form in three large volumes: Untersuchungen über Amino-Sauren, Polypeptide, und Proteine (1899–1906), Untersuchungen in der Purin Gruppe (1882–1906), and Untersuchungen über Kohlenhydrate und Fermente (1884–1908). His fame attracted students from all over the globe, including many men well known for their contributions to organic chemistry in this country.

Dr. Aaron Aaronsohn, agricultural expert and director of the Jewish Agricultural Experimental Station at Haifa, Palestine, was killed by a fall from an airplane May 15, near Boulogne, while flying from London to Paris. He had been a technical adviser to the U. S. Department of Agriculture for several years, and will be recalled through his rediscovery in 1906 of a wild emmer (*Triticum dicoccum dicoccoides*) in Palestine and Syria, believed to be a prototype of true wheat (E. S. R., 23, p. 533).

Adrian J. Brown of the University of Birmingham, England, well known for his studies in fermentation and permeability, died July 2.

Dr. W. G. Farlow, professor of cryptogamic botany of Harvard University, died June 3 in his seventy-fifth year.

**Miscellaneous.**—According to a recent note in *Science*, an association of the employees of the various public and private experiment stations in the Dutch East Indies was organized in connection with the eighth meeting of the technical personnel of these stations and the Department of Agriculture, held at Medan, Deli, Sumatra, April 23–26, 1919.

J. B. Knight, professor of agriculture in the Poona Agricultural College, India, has been appointed principal vice Dr. H. H. Mann, now acting director of agriculture for Bombay.

The Franklin Institute of Philadelphia has awarded its Edward Longstreth Medal of Merit to Dr. J. J. Skinner of the Bureau of Plant Industry, U. S. Department of Agriculture, for a paper entitled Soil Aldehydes.

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# EXPERIMENT STATION RECORD.

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Looking backward is not necessarily an unprofitable procedure. Especially is this true when progress seems slow and difficulties are disturbing, as sometimes appears to be the case in agricultural investigation. In such a mood, as well as at other times, a review of the toil and travail through which a strong and prosperous research institution has been developed may be well worth while.

Opportunity for such a retrospect has recently been afforded by an article entitled Beginnings of Agricultural Education and Research in California. This article was prepared as a contribution to the recent Semicentennial of the University of California, and is embodied in the latest report of the California Experiment Station. Its author is Prof. E. J. Wickson, emeritus professor of horticulture, who has been connected with the College of Agriculture and Experiment Station for thirty-eight years and who was its dean and director for seven years. Thus it contains a fund of first-hand and authoritative information regarding the early days of the institution, and which, true to the author, is set forth in a graphic and entertaining way.

Although one of the newer States in point of settlement, California was among the first to manifest an interest in agricultural education and research. The promotion of agricultural improvement was specifically included as a legislative function in the constitution of 1849, under which the State was admitted to the Union. Efforts to establish an agricultural college began soon afterwards. A speaker at the State Fair in 1857, after citing what had already been done in Michigan and Wisconsin, declared that "there is tenfold greater necessity for an agricultural school here. Although agriculture has been successfully pursued here for the last four or five years, yet farming has hitherto been a matter of experiment and must continue so for many years to come. We have a different climate, a different soil, and different modes of culture must be adopted from what we have hitherto been accustomed to. The farmer has everything to learn. The books treating of agriculture written in the older States or in England are to him of little account, and notwithstanding all the knowledge and experience acquired by him elsewhere, he finds himself a novice here. . . . We want then an agricultural college."

Two years later another writer advocated an institution for the collection and experimental trial of fruits and other plants. This

work, he maintained, "can only be done by legislative endowment, which, by the judicious expenditure of public funds, receives back the evidence of its enlightened stewardship by the prosperity of the people thus promoted."

Efforts to establish an experimental farm under powers granted in 1854 to the State Agricultural Society, and by another society to operate a garden near Sonoma for plant introduction and propagation, had already proved abortive. So also did attempts to provide an agricultural college until 1868. In that year a merger was effected of a proposed "Agricultural, Mining, and Mechanical Arts College," chartered two years previously, with the College of California to constitute the University of California and to receive the Federal land-grant under the Morrill Act of 1862.

Organization of agricultural instruction at the university began with the appointment in 1869 of a "professor of agriculture, chemistry, agricultural and applied chemistry, and horticulture." The first building to be erected by the university was denominated the "college of agriculture," and announcement was made in 1870 of the purpose of the institution "to furnish the facilities for all needful experiments; to be the 'station' where tests can be made of whatever claims attention; to become the exponent and repository of our progressive knowledge."

Despite this auspicious beginning Professor Wickson records many discouragements and setbacks. The "college of agriculture" building was, upon completion, largely preempted by the scientific departments, the library, and certain administrative offices of the university, leaving to the agricultural work for several years only half of the basement. Not until 1889 did the department really have an instruction building of its own, and this a $16,000 frame structure, supplemented by numerous other small buildings which from time to time had become available through abandonment for other purposes.

Similarly for many years no land was available for the professor of agriculture, who at the outset, we are told, was not "permitted to plant a tree or make a single experiment on the grounds of the university, either in agriculture or horticulture." After the appointment as professor of agriculture of Dr. E. W. Hilgard in 1874 this condition was to some extent remedied, yet the lack of adequate farm facilities up to the purchase and development of the 779-acre university farm at Davis constituted a most serious handicap for over thirty years to both education and research in agriculture.

Notwithstanding these obstacles and others which are feelingly described, an experiment station was established by the board of regents in 1873. Dr. Hilgard was appointed its director in 1874, and in the following year he began the first field experiments, a comparison of deep with shallow plowing for grain growing and long-con-

tinued tests of various fertilizers. In the same year a laboratory for work in agricultural chemistry was equipped, funds of $250 a year for two years being allotted by the board of regents. At the end of this time, the legislature took up the matter and provided for the continuation and some extension of the work by special and varying appropriations from year to year.

Once experimental work was under way, the large area of the State, coupled with its great diversity of agricultural conditions and interests, made quite difficult the concentration of such restricted resources as were available. As Professor Wickson states, "there was such a pressure toward diversified knowledge that the experiment station was actually not allowed to classify, correlate, and discriminate, but was forced to take up a bargain-counter business, by research into foreign records, by local observation, and by current experimentation, which would supply each of a throng of patrons with the particular goods which he conceived to be desirable to him. The California Station, therefore, laid out little work from its own reasonable conception of what it should do to erect a system of agriculture locally desirable, as many other State stations had plenty of chance to do. In California it was from the beginning merely a question of doing as much as possible of what the public demanded, and this has been its main problem to the present day."

One result of the pressure for local experiments, however, elementary, was the splitting up of the Hatch funds when these became available through the establishment and maintenance of four "outlying culture stations" distributed through the State. The history of these substations is recounted in the article under the suggestive heading of "ships that passed in the night." Since these four substations, part of the operations of the central station, and the supervision of all of them were supported by the $15,000 per year of the Hatch fund, it is easy to accept the statement that the financial stringency of the agricultural department of the university was in no way relieved by the Hatch appropriations.

The closing of the last of the quartet in 1909 after about a decade's operations terminated "the careers of this brood of outlying stations without mourners. Their chief crime was poverty, which restricted their undertakings, reduced their custodians to care-takers, and made it impossible to even aim at results of wide significance. And while they existed they prevented development of the central station from securing additional experts who were needed and from properly equipping such workers as were secured. Their chief contribution to the development of the department was the demonstration which they furnished of interest and activity of the institution in local problems, and this afterwards assisted in securing opportunities for more capable local undertakings."

One useful sequence of the demand for local research facilities was the establishment in 1905 by the legislature of the Plant Disease Laboratory at Whittier. An even more important outcome was the Citrus Experiment Station at Riverside, subsequently expanded into the Southern California Graduate School of Semi-Tropical Agriculture and Citrus Experiment Station.

The only line of work which was "formally predestined for the California Station was, it appears, soil investigation and exposition." The fundamental studies of Dr. Hilgard and his associate Dr. Loughridge were summarized in these pages at the time of their retirement from active service in 1909[1]. Starting in 1877 with analyses of a few California soils the work was steadily continued and developed, embracing the first comprehensive soil survey in this country, the first systematic investigation of the alkaline soils of the Pacific slope, the classic researches of the soils of regions deficient in rainfall, and many other phases of soil investigation of the utmost value.

Mention has already been made of the importance attached in the pioneer days to plant introduction and distribution. Despite the shortage of land a garden of economic plants was begun in 1879 and continued with some modifications until 1918, when its site was utilized for military purposes. This garden attracted much attention from visitors, and served as a source of supply for the annual distribution of seeds and plants for many years. Special attention was given to the testing of drought-resistant perennial forage plants, and much service was rendered in demonstrating the suitability of numerous species and the worthlessness of others. Another important phase was with cereals, including tests to demonstrate the possibility of growing in the State wheat rich in gluten. Other work had to do with forest trees, notably eucalyptus, some of these trials being conducted at the forestry substation established and maintained at Santa Monica.

As a specific illustration of the extent to which the policies of the station were shaped by insistent demand from the public rather than its own conception of what was fundamental and most widely useful, Professor Wickson cites the development of viticultural work from the standpoint of wine making. In 1875, soon after the opening of the station, wine analyses were begun. Field studies of the phylloxera were instituted the same year, and the work as a whole was so developed that from 1880 to 1895 the station publications on viticulture were almost equal in volume to those on all other subjects combined. A viticultural laboratory was definitely established in 1880, following State appropriations of $3,000 per annum, a portion of the one-story university carpenter's shop being utilized for the purpose after a small cellar had been excavated for fermentation studies. In recent years attention has been concentrated more largely

[1] Experiment Station Record, 21, p. 1.

upon the cultural phases of the industry and the protection of vines from insects and fungus diseases, much of this work being directly applicable to the table grape and raisin industry, and making the studies of the grape and its products among the most comprehensive undertaken anywhere.

Another popular demand led to extensive variety testing of olives and to a less degree of numerous other fruits. In 1893 no fewer than 1,158 varieties of tree fruits were under observation at Berkeley and the various substations. The results of these tests, however, were very disappointing as regards the discovery of improved sorts, and Professor Wickson concludes his summary of these tests as follows: "It seems, therefore, wise that the station investigators in more recent years have directed effort toward fundamental problems which are less susceptible of solution by practical experience than are the adaptability and serviceability of varieties. If it could have been foreseen thirty years ago that varietal effort should be directed toward securing the best forms and performances of varieties already demonstrated to be suitable, rather than to find substitutes for them, more profound horticultural philosophy would have been disclosed and greater public service rendered."

In entomology and plant pathology progress was retarded for many years by financial inability to provide specialists. For more than a decade the institution had no trained entomologist, and in 1891 when funds became available the selection of candidates was decided, we are told, by the fact that the successful aspirant had also listened to a lecture course on fungi and bacteria. None-theless, considerable had been accomplished along both these lines. Tests of Millardet's "copper-lime" fungicidal discovery (Bordeaux mixture) were undertaken in 1886. A year later analyses of insecticides were made and warnings given as to adulterations; spraying for codling moth under California conditions was done; and the feasibility of hydrocyanic acid gas for the fumigation of citrus trees was demonstrated. Numerous more technical investigations were begun as State funds became available. In 1907 the plant pathologist who came to California alone four years previously had twelve field and laboratory assistants, with two laboratories in Southern California as well as laboratory headquarters at the college.

Although there was little popular interest in fertilizers for many years, analyses were begun in 1877. Fertilizer control legislation was advocated in 1877, and after long agitation a law requiring labeling to show both the content and source of the material was enacted in 1903. This law not only accomplished its primary purpose, but proved of much assistance to the station as a source of revenue, which was still sorely needed.

Research in animal industry was practically precluded by the lack of a station farm and other facilities until the acquisition of the

university farm at Davis in 1905. Analyses of feeding stuffs, however, were begun as early as 1882. The first feeding experiment, a test of beet pulp for dairy cows, was made in 1901. At the solicitation of poultry farmers, a special appropriation for poultry research was granted in 1903 and work begun in poultry diseases, feeding problems, and the like. At about the same date a discarded horse shed was remodelled into a veterinary laboratory, and considerable attention began to be given to hog cholera control and other animal diseases.

Special mention should also be made of the study on human foods, first undertaken in 1895. In 1900 the station became one of the group cooperating with the nutrition investigations of the U. S. Department of Agriculture, studying particularly the nutritive value of fruits and nuts. Many interesting and valuable results were secured from this work, but as Professor Wickson states, "perhaps the difficulties under which these elaborate studies were pursued is the most interesting academic aspect of them. These may be indicated by the fact that the work was done in the only places which could then be found for it, viz: a corner of the main laboratory, a corner of an abandoned boiler shop, and a corner of an attic lighted by a small skylight, but it proved to be work done in a corner proclaimed from a house top, and its influence has been very great and wide-reaching in promotion of wholesome living and the recognition of the food value of California fruit products."

The summary here given of Professor Wickson's article is necessarily much abbreviated, with no attempt to present a complete review of the station's accomplishments. The aim has been rather to bring out some of the difficulties under which the work was conducted in the pioneer days, and especially the fact that these handicaps were not allowed to dishearten or continue insuperable. Inadequate funds, lack of buildings and equipment, popular pressure for immediate results, however localized and ephemeral their value, these have unfortunately been all too common in the history of most of the stations, but the experience of California is a concrete illustration that slowly but none the less surely progress can be made.

In that State, the total income of the station of $250 in 1874 has grown to over $200,000 a year. The basement rooms have given place to stately buildings, extensive experimental fields, and a score or more of well-equipped laboratories, representing a permanent investment of more than a million dollars. The staff has increased from a fraction of the director's time to a corps of upwards of a hundred specialists and other trained workers. An extended list of projects is under way, and the fruits of many are being widely applied. The confidence of the State has long since been gained, and the position of the station within its field has become one of unquestioned leadership. These are a few of the inspiring facts to be gleaned from Professor Wickson's interesting narrative.

# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**An introduction to the study of biological chemistry,** S. B. Schryver (*London: T. C. & E. C. Jack, Ltd.* [*1918*], *pp. 340, figs. 26*).—This volume, which is designed particularly for students of medicine and biology, deals primarily with the structure of materials of which the bodies of living objects are composed. The subject matter includes chapters on the general scope of biochemical study; the identification and analysis of organic compounds; the "constitution," or "structure," of some of the simpler organic compounds; stereoisomerism; the chief chemical constituents of the animal body; the methods employed for investigation of chemical changes within the animal organism; and the chemical processes taking place in plants.

**The chemical examination of three species of larkspurs,** O. A. Beath (*Wyoming Sta. Bul. 120* (*1919*), *pp. 55–88, figs. 16*).—This bulletin gives a preliminary and general report of a chemical investigation of three species of larkspurs, *Delphinium barbeyi*, *D. glaucescens*, and *D. geyeri*, with a view to determining the nature of the poisonous principles and their variation in kind and amount in the different species and at different periods of growth. The subject matter is divided into four parts. Part 1 contains a general discussion based upon the literature of the distribution and toxicity of larkspurs, cattle losses from larkspur, and the characteristic symptoms of larkspur poisoning. Part 2 deals with the experimental methods employed in the chemical investigation, part 3, with the chemical analysis of the three varieties studied, and part 4, with the treatment for larkspur poisoning as outlined in U. S. Department of Agriculture Bulletin 365 (E. S. R., 35, p. 779).

In the preliminary examination of the larkspurs, the green plants were macerated with water and the extracts tested for their toxicological value by administration to rabbits through a stomach tube. The toxic substances proved to be alkaloidal and capable of being extracted completely with water, indicating their occurrence in the plant in the form of water-soluble salts. Extracts from the leaves of *D. geyeri* and *D. barbeyi* were more active than those from the stems and flowers, and those from immature plants of these species from three to four times more effective than those prepared from a similar quantity of mature plants. No fatalities resulted from the extracts of *D. glaucescens* nor from extracts prepared from plants in the seeding stage of any of the species. Repeated administration of the poison did not produce immunity in rabbits.

For the separation and determination of the alkaloids, the three species, with the exception of *D. geyeri*, were employed at three periods of growth—immature, mature, and seeding stages. The material was air-dried and reduced to a uniform powder, percolated with alcohol, the percolate concentrated, extracted with water, acidified, clarified by filtration and by the use of animal charcoal and potassium sulphocyanid, made alkaline with ammonium hydroxid, and the alkaloids finally extracted with chloroform. The customary separation of the alkaloidal constituents by the use of immiscible solvents was employed.

The results obtained with *D. barbeyi* indicate that three distinct amorphous alkaloids are present throughout the life of the plant, and that one crystalline alkaloid exists in the free state during the early stages of growth. The principal poison from the standpoint of activity is an amorphous alkaloid precipitated from acidulated solutions by ammonium hydroxid and hydrolyzed by alcoholic potassium hydroxid into simpler derivatives. Plants at the flowering stage were found to contain more of this poison than the undeveloped plants.

From the leaves and stems of *D. geyeri* three alkaloids were isolated, one amorphous and two crystalline. The amorphous alkaloid corresponded in its physical and chemical properties to the principal alkaloid isolated from *D. barbeyi*, but yielded a different crystalline base on hydrolysis and appeared to be of somewhat milder toxicity. The crystalline alkaloids did not resemble that of *D. barbeyi*.

In *D. glaucescens* the number and form of the alkaloids remained uniform throughout the life of the plant, and differed in quantity only in the different parts of the plant. These consisted of one crystalline and one amorphous form. The amorphous alkaloid was insoluble in water, not precipitated by ammonium hydroxid, and was decomposed on hydrolysis into nonalkaloidal substances. This would seem to have some bearing on the fact that *D. glaucescens* is much less poisonous than the other species studied.

"From a chemical point of view, therefore, the three species vary in many respects. Important plant products, not mentioned in this preliminary bulletin, have been isolated and examined which add further evidence to the statement that there is a specific difference involved in the three species."

**Composition of the fruit of Cicer arietinum,** A. Zlataroff (Zlatarow) (*Ztschr. Untersuch. Nahr. u. Genussmtl., 31 (1916), No. 6, pp. 180–183; abs. in Chem. Abs., 11 (1917), No. 17, p. 2512*).—This investigation completes the study of *C. arietinum* (chick-pea) previously noted by Zlatarow and Stoikow (E. S. R., 30, p. 558).

The composition of the chick-pea calculated on a dry basis was as follows: Ash 2.87 per cent, fat 6.3, starch 50.32, crude fiber 3.62, total N 3.34, protein N 2.11, nuclein N 0.10, ammonia N 0.10, amid N 0.01, amino acid N 0.12, peptone N 0.007, N by difference 0.797, total $P_2O_5$ 0.998, lecithin $P_2O_5$ 0.142, protein $P_2O_5$ 0.486, inorganic $P_2O_5$ 0.118, and soluble organic $P_2O_5$ 0.244 per cent.

**Soft corn: Its chemical composition and nitrogen distribution,** G. Spitzer, R. H. Carr, and W. F. Epple (*Jour. Amer. Chem. Soc., 41 (1919), No. 8, pp. 1212–1221, figs. 2*).—This investigation, reported from the Purdue Experiment Station, was undertaken to determine the composition of soft corn and the nature of its proteins and to secure data on which qualitative classification can be made as to the maturity of corn. Three series of samples were used, one series selected because of the extreme softness of the corn and its failure to germinate, another representing more mature corn capable of germinating, and a third an intermediate grade.

The analytical data presented include a table showing the comparative composition of normal corn and of the three series studied. The principal differences in composition as brought out by this table are as follows:

The total nitrogen of soft corn is only slightly lower than that of mature corn, but the amid nitrogen is much higher. Zein is present in smaller amounts in soft than in mature corn, while the other proteins are present in about the same amounts in both. This is thought to indicate that zein is formed last and that amid is formed at the expense of zein. The acid-hydrolyzed proteins do not differ significantly in the different grades of corn. The percentages of

normal starch and nitrogen-free extract appear to be higher and the fat lower in soft than in mature corn.

As a basis for grading corn for feeding purposes, the authors recommend the determination of amid nitrogen together with the degree of acidity. The calorific determination is considered to be of little value.

**Ilex vomitoria as a native source of caffein**, F. B. Power and V. K. Chesnut (*Jour. Amer. Chem. Soc., 41 (1919), No. 8, pp. 1307–1312, pl. 1*).—The authors have applied the method noted on page 412 to a systematic examination of representative samples of *I. vomitoria* and of other American species of Ilex for the purpose of determining their availability as a commercial source of caffein.

It was found that an abundant source of caffein is available in *I. vomitoria*, but that no other North American species of Ilex appears to contain caffein. It is also not found in the leaves of the European holly (*I. aquifolium*).

**Isolation of the iodin compound which occurs in the thyroid, I**, E. C. Kendall (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 125–147, figs. 2*).—The author describes in detail the investigations of the chemical constituents of the thyroid gland leading up to the isolation of thyroxin, the iodin-containing compound to which the activity of the gland is ascribed. A discussion is included of the various conditions which influence the isolation of thyroxin in pure crystalline form.

Previous reports on this subject have been noted from other sources (E. S. R., 39, p. 803).

**The catalytic decomposition of hydrogen peroxid**, G. Phragmén (*Meddel. K. Vetensk. Akad. Nobelinst., 5 (1919), No. 22, pp. 13, figs. 5*).—The decomposition of hydrogen peroxid in alkaline solutions is shown to depend upon some catalyzer present either in the solution or in the glass of the apparatus employed. The extent of decomposition of hydrogen peroxid by living yeast cells was found to depend upon the amount of the yeast and, to a less extent, upon the H-ion concentration.

**Catalase action in yeast cells**, H. von Euler and R. Blix (*Meddel. K. Vetensk. Akad. Nobelinst., 5 (1919), No. 23, pp. 26, figs. 2*).—The catalase action in yeast cells is shown to be increased about 6 times by the addition of a small amount of protoplasma poison such as toluol or chloroform, from 10 to 15 times by drying the cells in air in such a way that the enzym is not destroyed, and from 20 to 25 times by heating an emulsion of the fresh yeast for from one to two hours at a temperature of from 55 to 63° C.

**Studies of the concentration of catalase in urine, chyme, and feces**, A. V. S. Norgaard (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 501–514, figs. 3*).—This paper describes methods of estimating catalase in urine, chyme, and feces, and discusses the interpretation of results from a chemical standpoint. The pyometer, or apparatus for measurement of oxygen, which is used by the author in catalase determinations is described and illustrated.

**Action of enzyms upon starches of different origin**, H. C. Sherman, F. Walker, and M. L. Caldwell (*Jour. Amer. Chem. Soc., 41 (1919), No. 7, pp. 1123–1129*).—This paper reports the results of a comparative study of the hydrolysis products of various purified starches as brought about by the action of different purified enzyms. The investigation included experiments upon the hydrolysis of wheat, maize, rice, and potato starches by means of saliva, pancreatin, purified pancreatic amylase, malt extract, purified malt amylase, taka-diastase, and purified amylase of *Aspergillus oryzæ*. The general plan was to purify the starches in four different ways: (1) Washing with water only, (2) with very dilute alkali, (3) with ether after washing with water, and (4) with

ether after washing with alkali. The enzyms were allowed to act upon a 1 per cent dispersion of the boiled starch for 30 minutes at 40° C., using such an amount of the enzym solution as would result in the formation of about one-third to one-half of the theoretically possible amount of maltose, and finally determining the reducing sugar formed by titration against Fehling's solution. The results, which are expressed in tabular form in percentage of starch digested in 30 minutes, may be summarized as follows:

When similarly purified by washing with a very dilute alkali, wheat, maize, and rice starches were all transformed into reducing sugar at essentially the same rate whatever the digestive agent. When washed with water only, potato starch was almost pure, but the cereal starches appeared to contain sufficient amounts of fatty or waxy matter to interfere appreciably with the action of the enzyms. This was true to a greater extent of the maize than of the wheat starch, a result which emphasizes "the importance of such preparation of maize products as shall insure their very thorough mastication and admixture with saliva." The removal of the fatty matter by ether tended to increase the rapidity of digestion of the cereal starches, but not always to the same extent as purification with dilute alkali.

The rate of enzymic hydrolysis of potato starch was in general equal to or slightly greater than that of the cereal starches. This is in agreement with preliminary results obtained in the same laboratory by K. Hattori in a study of the comparative rate of hydrolysis of rice and potato starches by means of saliva. A slightly higher yield of reducing sugar was obtained from the potato than from the rice starch, the difference increasing gradually with the extent of digestion.

**The growth of certain bacteria in media of different hydrogen-ion concentrations**, B. COHEN and W. M. CLARK (*Jour. Bact., 4 (1919), No. 4, pp. 409–427, figs. 4*).—An investigation of the influence of pH upon rates of growth of bacteria during that period in the life history of a bacterial culture commonly known as the period of logarithmic increase is reported from the Bureau of Animal Industry, U. S. Department of Agriculture. The results obtained are summarized as follows:

"There is a broad zone of pH within which the rates of growth are quite uniform for those short periods during which the increase of viable cells approaches the logarithmic rate. On the borders of these zones of pH slight change in the pH produces a marked effect upon reproduction. The acid border shifts with the nature of the acid. A distinct difference between the effect of hydrochloric and that of acetic acid was noted. While no distinct optimum reaction was found when only the logarithmic increase was considered, more distinct optima appear when longer periods of growth are observed. The period of 'lag' is more pronounced in alkaline than in acid media. Evidence is presented which suggests that the effect of pH upon specific fermentative processes, upon reproduction in its several stages, and upon rates of death must be kept distinct."

**The use of coal as a substitute for talcum to induce rapid boiling**, E. C. KENDALL (*Jour. Amer. Chem. Soc., 41 (1919), No. 8, pp. 1189, 1190*).—Anthracite coal has been found to be an ideal agent for bringing about the rapid boiling of a solution and for preventing bumping in Kjeldahl flasks and in the distillation of organic liquids. One or two pieces about 1 cc. in size are considered better than many smaller pieces. The coal becomes less active after being kept under water for some time, but can be reactivated by heating in an oven.

**The use of turpentine resin in turpentine as a foam breaker**, E. C. KENDALL (*Jour. Biol. Chem., 38 (1919), No. 3, p. 529*).—The author has found that from 1 to 2 cc. of a 20 per cent solution of resin in turpentine is very efficient as a

foam breaker for use in the rapid aeration of blood and other fluids and is much cheaper than caprylic or amyl alcohol. If the resin solution is not neutral to alizarin, either N/10 sodium hydroxid or sulphuric acid should be added to exact neutralization.

**The rapid estimation of perchlorates, alone, or in the presence of chlorates and chlorids**, J. G. WILLIAMS (*Chem. News, 119 (1919), No. 3090, p. 8*).—The method described is based on the oxidation of titanous chlorid by perchlorates in the presence of sulphuric acid and the estimation of the oxidation by titration of the cooled solution with ferric alum solution, using as an indicator two or three drops of a 10 per cent solution of potassium thiocyanid. The method is said to give a good degree of accuracy and to be much more rapid than the fusion method.

**A method for the volumetric estimation of sulphates**, A. C. D. RIVETT (*Chem. News, 118 (1919), No. 3085, pp. 253, 254*).—The method depends upon the fact that moist precipitated barium oxalate reacts quantitatively with soluble sulphates of certain metals to give barium sulphate and the soluble oxalates of these metals. The latter may be titrated in the filtrate with potassium permanganate.

Tables are given showing the percentage error under different conditions, from which the following limitations of the method are deduced: "It is inapplicable in acid solutions, and can not be used to determine sulphates of metals forming insoluble oxalates or sulphates in presence of salts containing radicals capable of forming insoluble barium salts. The presence of halids is objectionable in preventing accurate titrations with permangante. There will, however, be many works solutions to which the method may be applied with accuracy and considerable saving of time."

**The determination of phosphoric oxid, particularly in fertilizers, soil extracts, and the like**, B. DE C. MARCHAND (*So. African Jour. Sci., 15 (1919), No. 5, pp. 357–363*).—The method described, which is attributed to H. J. Vipond, is a combination of von Lorenz's method of precipitation for ammonium phosphomolybdate (E. S. R., 13, p. 14) and Pemberton's volumetric method for the determination of the precipitate (E. S. R., 5, p. 444).

Analytical data are presented from which the factor for conversion of cubic centimeters of N/10 sodium hydroxid to grams of phosphoric oxid has been found to be 0.000284 instead of 0.0003089 as used by Pemberton.

The volumetric method is recommended for soil extracts and plant ashes, and is thought to be capable of greater accuracy than methods such as that of Neubauer (E. S. R., 17, p. 731), in which the phosphoric oxid is weighed as magnesium pyrophosphate.

A note by B. J. Smit on the recovery of ammonium molybdate from the residues from the above method is appended.

**The determination of total nitrogen in soils containing rather large amounts of nitrates**, R. S. SNYDER (*Soil Sci., 6 (1918), No. 6, pp. 487–490*).—Determinations by various methods of the total nitrogen in soils containing large amounts of nitrates, in soils originally containing no nitrates but to which known amounts had been added, and in soils very low in organic carbon, are reported. From the analytical data presented the following conclusions are drawn:

"Many soils have a high nitrate content (up to 10 per cent of the total nitrogen) and the recovery of this nitrate is necessary in total nitrogen determinations. If the organic matter of the soil is within the usual average (0.8 to 3 per cent), it is not necessary to use the modified methods for total nitrogen, the common unmodified methods (Hibbard or mercury) giving quite as accurate results. Methods for total nitrogen, modified to include the nitrogen of nitrates,

must be employed, however, if the soils are lower than 0.5 to 0.6 per cent of organic carbon."

**Aids to the analysis of food and drugs.** C. G. Moor and W. Partridge (*London: Baillière, Tindall & Cox, 1918, 4. ed., pp. XI+268*).—This book contains in compact form information dealing with the analysis of foods, the more common drugs, disinfectants, and soaps. In this fourth edition the subject matter has been revised, and several new sections have been added. An appendix enumerates the alterations in the composition of food and drugs in England necessitated by the war.

**An improved method for the quantitative determination of caffein in vegetable material.** F. B. Power and V. K. Chesnut (*Jour. Amer. Chem. Soc., 41 (1919), No. 8, pp. 1298–1306*).—Inaccuracies in previous methods of determining caffein are pointed out, and an improved method developed at the Bureau of Chemistry, U. S. Department of Agriculture, is described and its accuracy indicated by control experiments. The essential features of the method, the technique for which is described in full, consist in the extraction of the caffein by hot alcohol, treatment of the extract after evaporation of the alcohol with magnesium oxid to liberate the caffein from its combinations and to remove the tannin and other acidic substances from solution, hydrolysis of the hot water extract of the above acidified with 10 per cent sulphuric acid to decompose saponins, and finally extraction of the acid filtrate with six successive portions of chloroform and recovery of the caffein by distillation of the chloroform after the addition of a 1 per cent solution of potassium hydroxid to remove coloring matter.

The method is said to give results in close agreement with those obtained by the U. S. Pharmacopœia method of assay, and to possess some advantages over that officially adopted.

Analytical data are presented on the yields of caffein by the gravimetric method and as calculated from nitrogen determinations in samples of tea, coffee, coffee leaves and pulp, and guarana. The pulp of the coffee berry yielded about 0.89 per cent of caffein, an amount which is thought to render its utilization for the production of caffein worthy of consideration in view of the large amounts of material available.

**Process for the estimation of butter fat, coconut fat, palm kernel fat and their mixtures.** S. H. Blichfeldt (*Jour. Soc. Chem. Indus., 38 (1919), No. 11, pp. 150T–152T, fig. 1*).—Certain alterations in the previously noted process for estimating butter and coconut fats in margarin (E. S. R., 24, p. 213) are described, and analytical results obtained by the method at different laboratories are reported. The development of the process and some of the analytical data supplied are attributed to P. S. Arup.

**The iodin value (Wijs) of palm kernel oil.** R. H. Ellis and E. M. Hall (*Jour. Soc. Chem. Indus., 38 (1919), No. 10, p. 128T*).—Tables are given of the maximum, minimum, and mean values for the iodin number (Wijs) of a large number of samples of both crude and refined palm kernel oil, obtained by expression from kernels crushed in the mills under ordinary works conditions.

The mean iodin value of the expressed oil was in every case outside the range of the values usually given in standard texts. The authors conclude that the normal range of iodin value (Wijs) is from 16 to 23, and that any oil giving a value outside this range would be of doubtful purity.

**The cuprous chlorid-iodin method for reducing sugars simplified.** F. M. Scales (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 747–748*).—Certain improvements in procedure in Clark's modification (E. S. R., 40, p. 114) of the author's earlier method (E. S. R., 34, p. 611) for determining reducing sugars are described which are said to simplify the method and render it more accurate,

the ratio of reducing sugar to thiosulphate not varying as in the Clark modification.

The principal change is the use of dilute acetic acid to acidify the solution after the precipitation of the cuprous oxid. As this has no effect upon cuprous oxid, a known excess of iodin may be added and the cuprous oxid then dissolved by the addition of a very small quantity of hydrochloric acid. The cuprous chlorid formed is immediately acted upon by the iodin, and consequently no precautions against oxidation by the air are necessary. As soon as the cuprous oxid has been entirely dissolved by the hydrochloric acid the excess of iodin is titrated with thiosulphate, using starch as an indicator.

The method may be used for any reducing sugars.

**A note on the determination of the inorganic constituents of blood and other physiological material**, I. GREENWALD (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 439, 440*).—The author calls attention to the method previously described incidentally (E. S. R., 35, p. 714) of separating the organic constituents of the blood from the inorganic by precipitation with picric acid. With blood it is considered advisable to dilute to almost 10 volumes with water, add 1 per cent of acetic, hydrochloric, or sulphuric acid, saturate with picric acid, and then dilute to an exact multiple. After standing a few minutes the mixture can be filtered and measured portions of the protein-free filtrate taken for the analyses.

A table is given of the values obtained by the author with this method for the sodium, potassium, calcium, and "acid-soluble" phosphorus of dog blood and serum.

**Determination of ammonia in the blood**, S. MORGULIS and H. M. JAHR (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 435–438*).—The essential features of the method described consist in precipitating the blood proteins with *m*-phosphoric acid as soon as the blood is taken (to prevent the splitting off of ammonia), adding a known amount of standard ammonium sulphate to the blood filtrate to increase the ammonia content sufficiently to make it possible to examine the color produced by the nesslerization without changing the colorimeter, and absorbing the ammonia by permutit, which does away with the necessity of driving off the ammonia by aeration. The control is made with Ringer's solution, to which the same reagents are added in equivalent amounts. The technique of the method is described in detail, and a series of determinations of ammonia in the blood of normal individuals is given.

**Note on the Lewis-Benedict method of blood sugar determination**, S. MORGULIS and H. M. JAHR (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 119–123*).—Data are presented which show that the presence of creatinin increases the blood sugar value as determined by the Lewis-Benedict method. Concentrations of less than 2 mg. of creatinin per 100 cc. were found to have no effect upon the accuracy of the reaction, but with greater concentration the error in the sugar analysis increased progressively. The method is therefore considered by the authors to be without value in the sugar analysis of blood containing more than 3 mg. of creatinin per cubic centimeter.

**A method for determination of minute amounts of lead in urine, feces, and tissues**, W. DENIS and A. S. MINOT (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 449–452*).—The process, which is described in detail, "consists essentially in the removal of most of the organic matter by fusion with sodium nitrate, the precipitation of the lead as sulphid, its electrolytic deposition as lead peroxid, and the titration of the iodin liberated from potassium iodid when the lead peroxid deposit is treated with dilute acid."

The authors have been able to recover by this method lead added to urine, feces, and tissues in amounts varying from 0.5 to 4 mg. to the average extent of 95 per cent of the amount added.

**A revised colorimetric method for determination of uric acid in urine,** O. FOLIN and H. WU (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 459, 460*).—The method is essentially the same as that described in a method for determining uric acid in blood (E. S. R., 41, p. 13). The preparation of solutions required and the technique of the method are described in full.

**A simplified macro-Kjeldahl method for urine,** O. FOLIN and L. E. WRIGHT (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 461–464, fig. 1*).—A simplified macro-Kjeldahl method for the determination of nitrogen in urine is described, which requires very little equipment and by means of which it is stated that a urinary nitrogen determination can be finished in from 20 to 25 minutes. The technique is as follows:

To 5 cc. of undiluted urine in a 300 cc. Kjeldahl flask are added 5 cc. of the phosphoric-sulphuric acid mixture previously described in connection with the micromethod (E. S. R., 41, p. 13), 2 cc. of 10 per cent ferric chlorid solution, and from 4 to 6 small pebbles. The mixture is boiled vigorously for 3 or 4 minutes over a microburner until dense white fumes appear. The mouth of the flask is covered with a small watch glass, and the heating continued vigorously for 2 minutes and gently for 2 minutes longer. The flame is removed and the flask cooled for not more than 5 minutes, after which 50 cc. of water and then 15 cc. of saturated sodium hydroxid are added, and the flask is connected promptly by means of a rubber stopper and ordinary glass tubing with a receiver containing from 35 to 75 cc. of N/10 acid, a drop or two of alizarin red, and water to make a total volume of 150 cc. The flask is again boiled for 4 or 5 minutes, after which the contents of the receiver are titrated to a faint red without cooling.

It is stated that the simplified distillation process is applicable to other determinations involving the removal of ammonia. The destructive digestion process is not applicable to highly resistant material, such as milk or urines containing much sugar, unless fuming sulphuric acid be used in place of the ordinary acid.

**Vinegar making from apples,** S. F. ANDERSON (*Jour. Agr. [New Zeal.], 18 (1919), No. 4, pp. 218–220, figs. 2*).—Directions are given for making cider vinegar on a small scale. The author recommends for final clarification treatment with isinglass, whites of eggs, or Spanish clay, and filtration through flannel.

**A fermentation process for the production of acetone and ethyl alcohol,** J. H. NORTHROP, L. H. ASHE, and R. R. MORGAN (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 723–727, figs. 2*).—The method described, which is protected by U. S. Patent 1,293,172 dedicated to public use, consists of the fermentation of a dilute solution of molasses with the production of ethyl alcohol and acetone by means of a culture of an organism to which the name *Bacillus acetoethylicum* has been given. The general characteristics of the organism, together with the optimum conditions for its growth, are summarized and the details of the process of fermentation described.

The optimum H-ion concentration was found to be from pH 8 to pH 6, which could be maintained by the addition of lime to the fresh mash. The fermentation when conducted on an experimental scale was complete in from 50 to 60 hours, with a yield of from 8 to 8.5 per cent of the sugar as acetone, and from 20 to 21 per cent of alcohol, mostly ethyl, but with traces of propyl and butyl alcohols. The fermentation may be made continuous in a fermenting tank filled with some inert substance, such as coke or beech shavings covered with a culture of the organism, by adding the fresh mash at the bottom and allowing the fermented mash to run off at the top.

**Biochemistry of Bacillus acetoethylicum with reference to the formation of acetone**, J. H. NORTHROP, L. H. ASHE, and J. K. SENIOR (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 1–21, fig. 1*).—The biochemical studies leading to the development of the process noted above are described in detail.

**The production of acetone and butyl alcohol by a bacteriological process**, H. B. SPEAKMAN (*Jour. Soc. Chem. Indus., 38 (1919), No. 12, pp. 155T–161T, figs. 7*).—This paper deals with the production on a factory scale of acetone and butyl alcohol by the bacterial fermentation of a concentrated corn mash.

**Contribution to the bacteriology and technology of the preservation of meat**, A. KOSSOWICZ and R. NASSAU (*Wiener Tierärztl. Monatsschr., 3 (1916), No. 3, pp. 81–102, figs. 2; abs. in Chem. Abs., 11 (1917), No. 17, pp. 2508, 2509*).—This is a discussion of the methods of canning meat commonly employed in Germany and of the causes of spoilage in the canned products.

*Proteus vulgare* and *Bacillus putrificus* are the two organisms considered by the authors to be the most important causes of spoilage. Perfect sterilization of the cans is said to be attained with a temperature of approximately 120° C. for 60 minutes.

**Studies on the preparation of vegetable decolorizing carbons for the cane sugar industry**, F. W. ZERBAN, E. C. FREELAND, and D. D. SULLIVANT (*Louisiana Stas. Bul. 167 (1919), pp. 44*).—The investigation reported in this bulletin comprised three phases: The preparation of decolorizing carbons from organic materials by impregnation with mineral substances and a comparative study of the resulting efficiency; the preparation of decolorizing carbons from materials impregnated by nature or by some manufacturing process; and the preparation of carbons from by-products and similar materials.

For the first study, the raw material generally employed was the sawdust of long-leaf yellow pine (*Pinus palustris*) and the impregnating material, well-defined chemical compounds—acids, bases, halids, and other salts. A definite amount of the sawdust was mixed with the different impregnating compounds in chemically equivalent quantities and subjected to similar methods of treatment, involving a final heating for two hours in a muffle furnace at about 900° C. After leaching with suitable solvents and washing with dilute hydrochloric acid and finally with water, the resulting carbon was dried at 105°. The decolorizing effect for sugar products of the carbons thus prepared was determined by adding 5 gm. of the carbon to 200 cc. of a standard molasses solution containing 30 gm. per liter of a final molasses. The mixture was brought to the boiling point, filtered through a folded filter, and the color determined by the use of the tint-photometer as described in a previous bulletin (E. S. R., 41, p. 203). The efficiency of each carbon was calculated from the color remaining in the treated solution in terms of Norit used as a standard. From the results of the impregnation tests, which are given in tabular form, the following conclusions may be drawn:

Organic nitrogen added to or present in the raw material increases the decolorizing power of the resulting carbon. Materials which are either gaseous or solid at the temperature of final heating produce effective carbons, while those which are liquid give poor ones. Compounds which attack carbohydrates most vigorously give effective carbons if liquids are not formed at the temperature of final heating. The fineness of division of both raw material and impregnating substance has a favorable effect on the resulting carbon. The decolorizing power of the carbon increases directly with the quantity of impregnating substance used per unit of raw material. The method of preliminary carbonization and the temperature of final heating influence the decolorizing power of the carbon. The first heating should be conducted in such a way that the

fumes evolved escape freely, and within certain limits the higher the temperature of final heating the greater the decolorizing effect of the resulting carbon.

In the second investigation, various plant materials high in ash were used for the preparation of decolorizing carbons with a view to the discovery of some cheap raw material for the production of effective carbon on a commercial scale. Of the materials examined, two were thought to be promising for commercial use—rice hulls and Pacific coast kelp. The most efficient methods for preparing these are described in detail. The former under the process finally adopted yields a carbon of a decolorizing power of 145 in percentage of Norit, and the latter of over 300.

The by-products and similar materials employed in the last part of the investigation included bagasse, filter press cake, impregnated molasses carbon, and a mixture of a black vegetable mold and finely divided calcium carbonate which occur in consecutive strata in some districts in Porto Rico. While not possessing the high efficiency of the carbon noted above, some of these materials would seem to offer cheaper sources of carbons greatly superior to bone black in decolorizing power.

**The deterioration of cane sugar by fungi**, N. and L. KOPELOFF (*Louisiana Stas. Bul. 166 (1919), pp. 3–72, figs. 3*).—This bulletin contains a survey of the fungus flora of the different types of cane sugar and the results of an investigation of the deterioration of cane sugar by fungi in pure culture, and of the presence of these organisms in the different stages of sugar manufacture.

Various media and a wide range of cane sugars were used for the isolation of the fungi. Czapek's agar was found to have the greatest relative efficiency of all the media studied for isolating a variety of fungi. A modification by the authors of this medium resulted in a more rapid colony development. This modification consisted in increasing the sucrose content from 30 to 50 gm. per liter and substituting 5 gm. of peptone and 1 gm. of ammonium nitrate for 2 gm. of sodium nitrate in the original formula.

The fungi isolated belonged chiefly to the Aspergilli and Penicillia. *Aspergillus niger* and a blue Aspergillus occurred in practically all samples. The latter, which appeared with the greatest frequency in all sugars, also had the greatest deteriorative power. Sterilized sugars inoculated with pure cultures of fungi deteriorated rapidly when the moisture content was appreciable, but only very slightly, if at all, when the moisture content was reduced to a minimum. Slight evidence of deterioration occurred in plantation granulated sugar with a factor of safety of 0.1 and in Cuban raw sugar with a factor of 0.2, which would indicate that the factor of safety for sugars infected with fungi is lower than generally supposed. The fungi spores were found to contain invertase and consequently to be responsible for the inversion of sucrose.

A daily bacteriological and mycological examination of each stage in the process of sugar manufacture showed that fungi and bacteria were found in greatest numbers in the raw juice. The clarification process served to sterilize the juice but reinfection took place in the massecuite in and about the centrifugal.

As practical deductions from this study the authors emphasize the importance (1) of reducing the moisture content of the sugar as much as possible and avoiding the subsequent access of moisture, and (2) of using every precaution to prevent reinfection of the massecuite after it leaves the vacuum pans. Suggestions are given for improvements in factory conditions and for proper methods for the handling and storage of the sugar after it leaves the centrifugal.

A list of 46 references to the literature is included.

**An improvement in casein making**, J. L. SAMMIS (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 764–767*).—As the result of a study of the causes of lack of uniformity in casein as it comes from the creamery, with resulting irregularity in the finished glue, revised directions for making casein are suggested.

The principal changes in method recommended are heating the skim milk to 95° F. instead of to a higher temperature, adding the dilute sulphuric acid slowly with vigorous stirring until a clear whey is obtained (avoiding excess of acid), and washing the resulting curd with water at 95° equal in volume to one-fourth the volume of the milk used.

Revised directions, suitable for the use of casein makers, are given in full.

**Agricultural industries**, F. WILBRANDS, edited by H. SIATS (*Lehre von den Landwirtschaftlichen Gewerben. Hildesheim: August Lax, 1917, 7. ed., pp. VII+79, figs. 32*).—The industries treated in the seventh edition of this handbook are starch manufacture, sugar manufacture, and the brewing and distilling industries.

## METEOROLOGY.

**The larger relations of climate and crops in the United States**, R. DEC. WARD (*Quart. Jour. Roy. Met. Soc. [London], 45 (1919), Nos. 189, pp. 1–19, fig. 1; 190, p. 146; abs. in U. S. Mo. Weather Rev., 47 (1919), No. 4, pp. 238–240, fig. 1*).—The various factors controlling the geographical distribution of staple crops and certain agricultural operations in the United States are briefly noted, the fundamental importance of climate being especially emphasized. The article is based largely upon information drawn from Geography of the World's Agriculture (E. S. R., 38, p. 895), and on the work of J. Warren Smith, Kincer, Reed, and others. The broad climatic characteristics of the agricultural provinces of the United States, proposed by M. Smith et al. (E. S. R., 35, p. 191), are described, and the specific climatic requirements of corn, wheat, oats, barley, and rye; cotton; hay, forage, and pasture; tobacco; citrus and other fruits; and potatoes and other truck crops, are discussed in some detail, as are the climatic conditions controlling live stock production, dairying, dry farming, irrigation, and forest growth. There is also a brief note on the relation of agricultural prosperity to the general welfare.

**Report of the chief of the Weather Bureau, 1918** (*U. S. Dept. Agr., Weather Bur. Rpt. 1918, pp. 292, pls. 7*).—This report contains, as usual, a review of the work of the Weather Bureau during the year with special reference, however, to war conditions and service. It is noted that the activities of the division of agricultural meteorology "have been continued, improved, extended, and given specially direct application as far as possible to all agricultural activities of the Nation." This division "has continued its study of the relation between weather and climate and crops. Data have been collected and tabulated and results obtained which are proving of marked advantage to agriculture."

There are also included in this report a general summary of the weather conditions in the United States during the year 1917, with charts, a list of observing stations and changes therein during 1917, and records of sunshine and details of excessive precipitation during that year.

**Monthly Weather Review** (*U. S. Mo. Weather Rev., 47 (1919), Nos. 3, pp. 143–204, pls. 16, figs. 14; 4, pp. 205–278, pls. 16, figs. 16*).—In addition to special forecasts and warnings, river and flood observations, notes on the effect of weather on crops, halo phenomena, and seismological reports for March and April, 1919; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during March and

April, 1919; condensed climatological summaries, and the usual climatological tables and charts, these numbers contain the following articles:

*No. 3.*—Convectional Clouds Induced by Forest Fires (illus.), by F. A. Carpenter; Notes on a Cumulus Cloud Formed over a Fire, by C. A. Reichelt; Rain from Cumulus Clouds over Fires (illus.), by J. P. Espy (extracts); Heights of Cumulus Clouds Forming over Fires (illus.), by S. P. Fergusson and C. F. Brooks; Results of Observations of Clouds during the Solar Eclipse, June 8, 1918 (illus.), by S. P. Fergusson; Clouds in East Texas, June 8, 1918 (illus.), by C. F. Brooks; The Reflecting Power of Clouds, by L. B. Aldrich (Abs.); An Improvement in the Pole Star Recorder (illus.) by B. C. Kadel; The Duration of Moonlight, by A. McAdie (reprinted); On the Relations of Atmospheric Pressure, Temperature, and Density to Altitude (illus.), by H. H. Kimball; Temperatures, Pressures, and Densities of the Atmosphere at Various Levels in the Region of Northeastern France (illus.), by W. J. Humphreys; The Minimum Temperature at the Base of the Stratosphere, by W. J. Humphreys; Why There Are No Clouds in the Stratosphere (illus.), by W. J. Humphreys; The Daily Variation of Temperature in the Lower Strata of the Atmosphere, by W. H. Dines (reprinted); On the Diurnal Incidence of Maximum and Minimum Temperatures at Eskdalemuir, by A. C. Mitchell (Abs.); Influence of Snow Cover on the Temperature Distribution in Utah, January, 1919 (illus.), by T. A. Blair; The Effect of Gunfire on the Rainfall of the British Isles, by H. R. Mill (reprinted abs.); Tornado at Porter, Oklahoma, March 15, 1919 (illus.), by J. A. Reihle; The Storm of March 16, 1919, at Fort Smith, Ark., by L. J. Guthrie; General Extent of Collegiate Instruction in Meteorology and Climatology in the United States, by C. F. Brooks; Meteorological Observations while Traveling, by R. DeC. Ward (Abs.); Some Economic Effects of the Mild Winter, 1918–19; and Measurements of the Solar Constant of Radiation at Calama, Chile, by C. G. Abbot.

*No. 4.*—Aerological Investigations of the Weather Bureau during the War (illus.), by W. R. Gregg; Some Scientific Aspects of the Meteorological Work of the United States Army (illus.), by R. A. Millikan; The Military Meteorological Service in the United States during the War (illus.), by B. J. Sherry and A. T. Waterman; Two-Theodolite Plotting Board (illus.), by W. C. Haines and R. A. Wells; Some Observed Irregular Vertical Movements of Pilot Balloons (illus.), by I. R. Tannehill; The Work of the Aerographic Section of the Navy, by A. McAdie; Work of the Naval Observatory in Connection with Naval Aerography, by C. T. Jewell; Meteorology in the Naval Aviation Service Overseas (illus.), by R. H. Finch; Blue Hill Methods of "Pilot Ballooning" (illus.), by I. Mall; British Pilot-Balloon Methods; The Shoeburyness System (reprinted); Free-Balloon Flight in the Northeast Quadrant of an Intense Cyclone (illus.), by C. L. Meisinger; Weather during Some Notable Airship Voyages; Hot Winds at Tampico, Mexico, April 6 and 7, 1919 (illus.), by S. A. Grogan; Tornadoes in Eastern Nebraska, April 6, 1919 (illus.), by G. A. Loveland; Tornado in Southern Alabama, March 5, 1919 (illus.), by P. H. Smyth; The Larger Relations of Climate and Crops in the United States (illus.), by R. DeC. Ward (Abs.) (see p. 417); Minimum Temperatures Sustained by Apricots during March, 1919, in the Pecos Valley, N. Mex., by C. Hallenbeck (see p. 444); The Meteorological Activities of the Late Prof. Edward C. Pickering, by R. DeC. Ward; Walter Gould Davis, by R. DeC. Ward; and Measurements of the Solar Constant of Radiation at Calama, Chile, by C. G. Abbot.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 6 (1919), Nos. 3, pp. [212], pls. 4, figs. 2; 4, pp. [209], pls. 4, figs. 2*).—These volumes contain brief summaries and detailed

tabular statements of climatological data for each State for March and April, 1919, respectively.

**The rainfall of France**, E. MATHIAS (*Ann. Chim. et Phys., 9. ser., 12 (1919), Mar.-Apr., pp. 109–244*).—The rainfall data for eight different zones of France are summarized and analyzed along the lines indicated in an article previously noted (E. S. R., 41, p. 119), that is, with special reference to the influence of altitude and latitude. The general conclusion reached is that within wide limits (the area of France, for example) the coefficient of altitude is constant along a given parallel of latitude, regardless of variations in the surface of the soil.

## SOILS—FERTILIZERS.

**Soils and soil cultivation**, F. D. GARDNER (*Philadelphia: John C. Winston Co., 1918, pp. 223, pls. 3, figs. 101*).—This book is designed "to be a handy reference work on soils, their classification and treatment, and the proper adaptation of crops, with a view to preserving and increasing the fertility of the soil and producing the largest yield in point of quality. . . .

"Not only are directions given for the management of the soil, but the best types of farm buildings and equipment are fully described and illustrated, including farm machinery of the latest type, farm sanitation, drainage, and irrigation."

**Soil survey of Caldwell County, N. C.**, W. B. COBB and S. F. DAVIDSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 29, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 327,680 acres situated in the northwestern part of the State. The topography of the northern two-thirds of the county is described as mountainous, and that of the southern third undulating to rolling. Natural drainage is well established.

The soils of the area are included in the Piedmont Plateau, the Appalachian Mountains, and the River Flood Plains provinces. The Piedmont soils have been derived largely from granite, gneiss, and schist, and the mountain soils chiefly from Carolina gneiss. The alluvial soils include both first-bottom and terrace material. In addition to rough, stony land, 13 soil types representing 8 series are mapped. Porters loam, Ashe loam, and Cecil clay loam, occupying 34.9, 19.6, and 15.9 per cent of the total area, respectively, predominate.

**Pleistocene and recent deposits in the vicinity of Ottawa, with a description of the soils**, W. A. JOHNSTON (*Canada Dept. Mines, Geol. Survey Mem. 101 (1917), pp. II+69, pls. 2, figs. 7*).—This report deals with the geology and soils of an area of 419 square miles along the Ottawa River and within the St. Lawrence drainage basin. The soils of the area are as a whole somewhat calcareous and are of glacial and marine origin. They are light to medium dark in color.

"The 'lightest' soils of the district are the æolian, river gravel, and beach soils. They occupy small areas and, on account of the relief of the surface and open porous character of much of the material, tend to be excessively drained and are easily affected by drought in dry seasons. The marine fine sand is also a light soil and has a loose porous structure, but on account of its nearly level or gently sloping surface and finer texture is not so easily affected by drought. The 'heaviest' soils of the area are the marine clay and clay loam soils. The soils intermediate between the light and heavy soils are the marine fine sandy loam soil and the glacial soils, of which the most important is the gravelly fine sandy loam. These soils are also of considerable extent."

The marine soils, including fine sand, fine sandy loam, clay loam, and clay, are the most extensive, covering over 60 per cent of the land of the area.

**Pyrolusite from Virginia**, T. L. WATSON and E. T. WHERRY (*Jour. Wash. Acad. Sci., 8 (1918), No. 16, pp. 550–560, fig. 1*).—This is a report of a study of the geology and mineralogy of manganese oxid crystals and crystalline minerals from the Virginia locality.

**The comparative rate of formation of soluble material in cropped and virgin soils as measured by the freezing-point method**, C. E. MILLAR (*Soil Sci., 7 (1919), No. 4, pp. 253–257, figs. 2*).—Tests conducted at the Michigan Experiment Station are reported in which 6 different soils in cropped and virgin condition were washed with distilled water until the concentration of the soil solution was reduced to only a few parts per million, and the effect of such treatment measured on the subsequent rate of formation of soluble material as determined by the freezing-point method. Soils 1 and 2 were silt loams relatively deficient in organic matter, 3 and 4 were lowland soils containing considerable organic matter, 5 was a sand soil, and 6 a very fine sandy loam.

It was found that the tendency for the concentration of the soil solution to reach a maximum and decrease before the end of the 40-day period was practically overcome by the washing. Some tendency for the concentration to decrease was exhibited by the virgin sample of soil 1 and by both the cropped and virgin samples of soil 4. The changes, however, were not sufficient to affect the conclusions. Nos. 1, 2, and 5 showed a decidedly greater rate of formation of soluble material in the virgin than in the cropped samples. In addition, the total concentration of the soil solution was much higher in the case of the virgin samples.

Of the remaining soils, Nos. 3 and 4 showed very little difference in either the rate of formation of soluble material or the total concentration of soil solution attained. These two soils showed very little change in productivity as a result of several years' cultivation. Soil 6 showed only a slightly greater rate of formation of soluble material in the virgin than in the cropped sample, the final concentration of soil solution being virtually the same.

The author feels justified in suggesting that "a marked decrease in the rate of formation of soluble material is one of the changes a soil may undergo as a result of several years of cultivation with the return of little fertilizing material."

**Changes in composition of the soil and of the water extract of the soil, following addition of manure**, P. L. HIBBARD (*Soil Sci., 7 (1919), No. 4, pp. 259–272, figs. 3*).—In experiments at the University of California, fresh manure was mixed with silty clay loam and sandy loam soils at rates of 1, 2, and 5 per cent and the mixtures kept in loosely covered glass jars under optimum moisture conditions.

Periodic analyses showed that the carbon dioxid content of the soil atmosphere was increased in proportion to the amounts of manure added, while the total carbon content gradually decreased, such decrease being more rapid for the larger amounts of manure. The total nitrogen content remained constant.

The total water-soluble matter decreased within a few weeks in the 1 per cent mixture to below that of the control soil, after which it gradually increased to considerably more than that in the control soil, but never to an amount equal to the sum of that in the control soil and that in the added manure. The 2 and 5 per cent manure mixtures showed relatively greater decreases and increases.

The changes were not relatively the same for the different ions and complexes. In the soil extract there was less change in calcium and magnesium than in potassium, sulphates, and nitrates. The nitrates at first quickly disappeared and later increased considerably over the amounts in the control. These changes are attributed to biochemical action.

It is concluded that "when fresh manure is mixed with soil the resulting reaction decreases the amount of water-soluble plant food, so that crops started at that time might be retarded or at least not immediately benefited by the manure. When the manure becomes well decomposed, it adds materially to available plant food. Consequently, fresh manure should not be added to a soil just previous to or during the time a crop is growing.

"If the soil is kept sufficiently open to the air, there should be no loss of nitrogen due to the addition of manure. Liberation of large amounts of $CO_2$ in the soil by rotting manure does not always greatly influence the composition of the water extract of the soil."

"Increase in water-soluble mineral matter after the addition of manure to soil can be accounted for largely by that derived from the mineral matter of the manure itself."

**Parallel formation of carbon dioxid, ammonia, and nitrate in soil**, P. L. Gainey (*Soil Sci., 7 (1919), No. 4, pp. 293–311, figs. 8*).—Studies of the parallel formation of carbon dioxid, ammonia, and nitrate in a silt loam soil, conducted at the Kansas Experiment Station, are reported.

It was found that "there is a remarkable similarity and agreement between the several carbon dioxid and ammonia curves when constructed from data secured under anything like similar conditions. If conditions are favorable for bacterial activity and cottonseed meal is added there is at first a very rapid formation of carbon dioxid and ammonia, the maximum being reached during the second 24 hours. After this the formation of both carbon dioxid and ammonia decreased rapidly, the curves soon tending toward straight lines. When dried blood was added to the soil the curves for both carbon dioxid and ammonia were different. Formation during the first four days was very slow, the maximum being reached between the sixth and eighth day analyses. The formation of carbon dioxid from dried blood was never so rapid as from cottonseed meal. . . .

"Insufficient moisture retards both carbon dioxid and ammonia formation, the latter much more markedly. The minimum moisture for active carbon-dioxid production is lower than for active ammonia production. For the soil used . . . 12 cc. of water per 100 gm. soil was near the minimum for vigorous carbon dioxid production, and increasing the moisture beyond this point had little effect upon the formation of carbon dioxid. A moisture content below this results in a lowered carbon dioxid production. The moisture necessary for optimum ammonia formation is higher than that for carbon dioxid.

"Insufficient aeration will also cause a depression or marked delay in carbon dioxid and ammonia production. . . . In no instance where the current of air was not continuous was the production of carbon dioxid and ammonia equally as rapid as where it was. In the case of carbon dioxid it appears to be simply a delayed production, the total quantity soon reaching that produced where aeration was abundant. The total ammonia produced under limited aeration did not, in most instances, reach the production where aeration was abundant. So long as the current of air was continuous, increasing the volume apparently had no effect. . . .

"Nitrate production in all experiments was for some unknown reason exceptionally low for this particular soil. As a rule there was no accumulation during the first few days. In fact, the small quantity of nitrate nitrogen initially present usually disappeared completely before the first analysis. Where aeration was insufficient, the beginning of accumulation was delayed still more. Where the moisture content was varied, nitrate accumulation was directly proportional to moisture content; the maximum not being reached until the maximum moisture that would be retained was reached. Where

aeration was varied, insufficient aeration retarded the initial accumulation, but after nitrification became active in all samples the accumulation was inversely proportional to aeration."

**Capillary moisture-holding capacity**, W. GARDNER (*Soil Sci., 7 (1919), No. 4, pp. 319–324, fig. 1*).—The author reviews and analyzes the work of others bearing on the subject, and is of the opinion that the dynamic character of typical soil moisture phenomena can not be overlooked in the attempt to define such a constant as moisture capacity. "In order to make postitive progress from a scientific as well as practical point of view, it would seem that fundamental concepts of this character should be carefully considered." A laboratory study of the dynamic phases of soil moisture is in progress at the Utah Experiment Station.

**On the penetration of the periodic temperature waves into a substance having no uniform constitution especially into the soil**, K. AICHI (*Tôkyô Sûg. But. Kizi [Proc. Tôkyô Math. Phys. Soc.], 2. ser., 9 (1918), No. 22, pp. 527–541*).—This is an intricate mathematical analysis of the subject, made in conjunction with actual temperature measurements in Japanese soils and in snow. It is shown that elaborate calculations, for example, by the use of the method of least squares, do not give sufficiently accurate information on which to base discussion of underground temperatures as compared with actual observations.

**The effect of certain colloidal substances on the growth of wheat seedlings**, D. S. JENNINGS (*Soil Sci., 7 (1919), No. 3, pp. 201–215*).—Experiments at the Utah Experiment Station with a complete nutrient solution, agar, silica, sand, ferric hydroxid, and aluminum hydroxid cultures with wheat are reported. The purpose was to determine whether or not the change in concentration due to solid adsorbing surfaces is sufficient to modify the production of dry matter in a plant.

It was found that "the effect of adding agar to nutrient solutions was to increase the growth of wheat seedlings in low concentrations and to decrease the growth in higher concentrations of nutrient salts. The introduction of colloidal silica into nutrient solutions resulted in increased weight of wheat seedlings. The increase was apparently due to direct absorption of silica by the plant and not to a change in the effective concentration of the nutrient solution. Silica gel is, therefore, considered unsuited for studies of the character described in this paper. The introduction of quartz sand, ferric hydroxid, and aluminum hydroxid into nutrient solutions resulted in decreased growth of wheat seedlings. It appears that these substances by their absorptive properties reduce the effective concentration of the nutrient solution."

**The influence of kind of soil and fertilization on nitrogen and ash content of crops**, J. G. MASCHHAUPT (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], No. 22 (1918), pp. 25–114, fig. 1*).—Continuing experiments previously noted (E. S. R., 28, p. 520), plat experiments with heather, moor, swamp, loam, and clay soils to determine the effect of the kind of soil and the fertilizers sodium nitrate, potassium nitrate, and ammonium sulphate on the contents of nitrogen and ash in barley, rye, beets, oats, and potatoes are reported.

A smaller increase in crops was obtained with potassium nitrate than with sodium nitrate on these soils. The influence of the kind of soil was greater with straw and beet and potato leaves than with grain or roots, and was greatest in the silica content of straw. The average silica content of straw from clay soils was five times that of straw from heather soils. There was no comparative effect on the content of bases. The composition of beet and potato leaves was more strongly affected by the kind of soil than was the

composition of straw, with special reference to nitrogen, potash, phosphoric acid, and lime. The kind of fertilizer had no marked influence upon the nitrogen and ash content of crops on these soils.

The acid constituents were influenced more than the basic constituents by both agencies.

**The abnormality of soils in field-placed cylinder experiments**, C. A. Mooers (*Soil Sci., 7 (1919), No. 4, pp. 247–251*).—In soil nitrogen studies at the Tennessee Experiment Station five different kinds of soil, when placed in cylinders sunk in the ground and exposed otherwise to natural conditions, were found to become unproductive to the extent of complete crop failure in the course of from three to eight years, except where limed.

Annual addition of acid phosphate, potassium chlorid, and sodium nitrate had little or no effect in preventing crop failure. Barnyard manure applied at the outset in moderate and even large amounts delayed crop failure only a year or two in most cases. The only unusual condition apparent was the projection of the cylinder rims for 2 to 3 in. above the soil surface, thereby preventing all run-off of water in times of heavy rainfall. The increased moisture supply and the excessive leaching were assumed to reduce the natural soil supply of calcium bicarbonate until it became the limiting factor in crop production and finally induced crop failure. The evidence also indicated an increased loss of nitrogen and uncertainty with regard to the phosphorus and potassium, the availability of which may have been increased. It is suggested that usual field conditions may be approached by providing each cylinder with an adjustable vertical slot, providing either a constant outlet or permitting run-off only at certain times of the year at the discretion of the operator.

**Mining and manufacture of fertilizing materials and their relation to soils**, S. L. Lloyd (*New York: D. Van Nostrand Co., 1918, pp. VI+153, figs. 9*).—This book is intended for fertilizer manufacturers, agricultural chemists, and farmers desiring advanced knowledge in agricultural chemistry, and deals essentially with the manufacture and mixing of commercial fertilizers from the standpoint of their practical use. A discussion of the chemistry of fertilizers and soils and of their relation is followed by a description of phosphate mining and manufacturing practice, nitrogen fixation, the mining and manufacture of nitrogenous and potassic fertilizers, and the mixing of compound fertilizers.

With reference to the fertilizers resulting from the fixation of atmospheric nitrogen the author summarizes experimental work with the statements that "calcium cyanamid neither suits humic acid soils, peaty soils, nor light sandy soils. On the other hand, it may be used in all loamy soils of average fertility. . . . The action of cyanamid is weaker than nitrate of soda; it is also slower than the latter. But as the unit nitrogen is supplied cheaper by the new manure, a greater amount can be used to restore the balance. . . . According to the experiment made, this manure succeeds very well on clay soils, but less so in sandy soils. . . .

"Nitrate of lime acts normally up to the second application in loamy soil and up to the third in sandy soil; but beyond that there is an injurious action, especially in loamy soils. The high percentage of basic nitrate of lime and the still higher percentage of nitrate of lime produce injurious effects.

"Nitrate of soda, Chile saltpeter, and sulphate of ammonia have regularly produced higher yields and better utilization of the nitrogen than cyanamid."

Two final chapters are included on the examination of fertilizers and fertilizing materials and on the examination of soils.

**Farm manure**, H. M. NAGANT (*Min. Agr. Prov. Quebec Bul. 53 (1918), pp. 29, figs. 8*).—This bulletin deals with the composition, fertilizing value, and conservation of barnyard manure, with special reference to conditions in the Province of Quebec. The use of manure pits is specially discussed.

**The world's supply of nitrogenous fertilizers**, G. W. ANDERSON (*Chem. News, 119 (1919), No. 3090, pp. 6, 7*).—This is a review of the nitrogen resources of the world, from which it is concluded that the production of nitrogenous products in Germany has been greatly promoted during the war and that in consequence a strong competition may be expected. Data are reported to show that there is a considerable excess of production over the probable consumption based on prewar estimates.

"Although the cost of production has gone up considerably, German manufacturers were able to write-off their plant during the war, and thus have the great advantage of low capital costs. This, together with the present favorable rate of exchange for exports, places the German trader in an advantageous position."

**War-time production of nitrogen compounds in Germany**, BUEB (*Jour. Gasbeleucht., 62 (1919), pp. 2, 3; abs. in Jour. Soc. Chem. Indus., 38 (1919), No. 7, pp. 219A, 220A*).—It is stated that the prewar production of nitrogen compounds in Germany was in excess of the requirements, but production was insufficient after war began and imports of Chilean nitrate ceased. Ammonia from coal distillation furnished about one-third of the amount required. New plants for the production of cyanamid were started but not completed, and effort was concentrated on the development of existing plants. The synthesis of ammonia by the Haber process was found to be the most economical in labor and fuel, and the process was put into successful operation at two places. The catalytic process for producing ammonia was widely used, the end product being sodium nitrate. As a result of the exigencies of war the supply of nitrogen fertilizers was cut down one-half. It is anticipated that under normal peace conditions synthetic products in combination with potash will suffice to make Gemany independent of imported nitrogen compounds.

**Comparative fertilizer experiments with new nitrogenous fertilizers.** SCHNEIDEWIND (*Bl. Zuckerrübenbau, 26 (1919), No. 3–4, pp. 28, 29*).—Comparative top-dressing experiments with sugar beets on a loess loam soil rich in organic matter are reported, in which it was found that potash ammonium nitrate gave as good results as sodium nitrate when used in an equal amount, while ammonium nitrate gave better results than ammonium sulphate but not so good results as sodium nitrate. The differences were not large. Ammonium chlorid gave as good results as ammonium sulphate.

Further experiments in which lime nitrogen was added before planting, added one-half as top-dressing and one-half drilled in after planting, and added one-half as top dressing and one-half broadcast after planting, showed that the addition before planting yielded the best results.

**Comparative test of several nitrogenous fertilizers**, BACHELIER (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 5, pp. 164–170; abs. in Chem. Abs., 13 (1919), No. 10, p. 1115*).—Ammonium nitrate was compared with ammonium sulphate and sodium nitrate in field experiments with sugar beets. As good results per unit of nitrogen were obtained with the ammonium nitrate as with the other substances used.

**Field experiments with nitrate of ammonia**, J. HENDRICK (*Jour. Soc. Chem. Indus., 37 (1918), No. 8, pp. 146R–148R*).—Field experiments with hay and oats on several different soils, conducted by the North of Scotland Agricultural College to compare ammonium nitrate with sodium nitrate, ammonium sul-

phate, calcium nitrate, and commercial calcium cyanamid as a source of nitrogen, are reported.

It was found as a general result of these experiments that "nitrate of ammonia may be expected to give, at least as great increases of crop, weight for weight of nitrogen, as any of the other concentrated nitrogenous manures in use."

Ammonium nitrate showed the best average results with both oats and hay. This result is considered unusual and possibly due to accidental causes. "If it is confirmed that nitrogen in nitrate of ammonia is more effective as a fertilizer than an equal weight of nitrogen in nitrate of soda, nitrate of lime, or sulphate of ammonia, it will be necessary to seek for an explanation of such an unexpected result."

**The setting of mixtures of superphosphate and ammonium sulphate**, F. S. Fowweather (*Jour. Soc. Chem. Indus., 38 (1919), No. 9, pp. 110R–112R*).—Experiments to determine the conditions that influence the setting into hard lumps of mixtures of ammonium sulphate with superphosphate are reported, in which mixtures of superphosphate, containing about 30 per cent soluble phosphate and ammonium sulphate, were placed under a heavy weight to bring the particles into intimate contact.

The conclusions drawn are that the rate of setting of such mixtures is increased by the reduction of free acid in the mixture. "The presence of moisture also tends to increase the rate of setting, but this effect is not very marked unless accompanied at the same time by reduction of free acid."

A large scale test confirmed the above conclusions. "Thus a compound fertilizer made from fairly fresh mineral superphosphate and ammonium sulphate to which a small amount of limestone was added set very considerably when stored in a heap for a few days, and after regrinding and putting into bags, no further trouble was experienced as regards setting."

**Phosphate demonstration in Stevens County in 1918**, P. R. McMiller, P. E. Miller, and G. H. Nesom (*Univ. Minn. Agr. Ext. Div. Spec. Bul. 34 (1919), pp. 7, figs. 2*).—Cooperative field experiments with acid phosphate on 25 farms in the county are reported in which the phosphate was added to fields ranging in size from 1 to 30 acres at the rate of 200 lbs. per acre. The soil in general is a black silt loam with silt loam subsoil. Of the 14 farmers who tried the phosphate on wheat nearly all secured a marked increase, ranging from 2.1 to as high as 10.5 bu. per acre. No increase was obtained with acid phosphate on oats, but there was an increase in six cases out of seven with barley.

"No heavy investments in phosphate are suggested, but the results of the experimental work in Stevens County to date make it appear a wise business measure for those farmers of Stevens and the immediately surrounding counties who have heavy soils on which some fields have received little or no manure, to apply on one of these half a ton or more of acid phosphate at the rate of 200 lbs. per acre, using wheat or barley as the trial crop and preferably seeding with clover."

**The phosphate industry**, J. Hendrick (*Jour. Soc. Chem. Indus., 38 (1919), No. 9, pp. 155R–157R*).—The author discusses the phosphate industry throughout the world, with special reference to the United States and Great Britain, and reports the average results of 66 field experiments with turnips covering four years at the North of Scotland Agricultural College comparing soluble and insoluble phosphates.

"The general result of the experiments is to show (1) that the average effect of superphosphate is only slightly greater than that of insoluble phosphate, such as basic slag or ground mineral phosphate, when equal weights of phosphoric acid are applied, and (2) that if one-third of the phosphoric acid is given as

soluble phosphate and the remainder as insoluble phosphate the average result is as good as when the whole of the phosphoric acid is given as soluble phosphate. Experiments with other crops and especially with grass give a similar result. The only conclusion one can come to is that soluble phosphate is overvalued, and insoluble phosphate, such as exists in basic slag and ground mineral phosphate, undervalued. It should be possible in future to use a large part of the rock phosphate in the form of finely ground powder instead of in superphosphate. This will effect a great saving in acid and in expense."

**American potash**, H. H. Roe (*Mining and Sci. Press, 119 (1919), No. 6, pp. 195–202, figs. 11*).—This is a summary of the various potash resources of the United States, from which it is concluded that this country has potash resources sufficient for future requirements but that the present supply will for some time to come be inadequate for the growing demand.

**The Alsatian potash industry**, F. K. Cameron (*Amer. Fert., 51 (1919), No. 4, pp. 49–54*).—It is stated that the Alsatian potash deposits cover an area of about 77 square miles, and consist of a lower bed with an average thickness of 11.5 ft. and an upper bed with a thickness of about 4 ft. The cubical contents of the two layers are estimated at approximately 1,350,000,000 cu. yds., containing approximately 1,500,000,000 tons of salt, or roughly 275,000,000 tons of potash. The soluble salts of the deposits are potassium and sodium chlorid alone, and the average potash content is said to be at least 18 per cent as compared to 12 per cent for the Stassfurt salts.

While the industry is too young to give accurate cost figures, an approximate estimate indicates that for potassium chlorid averaging 18 and 45 per cent potash, respectively, the cost is $11.00 and $28.75 per ton.

Features of the mining and manufacturing processes are described.

**The value of sodium when potassium is insufficient**, B. L. Hartwell and S. C. Damon (*Rhode Island Sta. Bul. 177 (1919), pp. 4–32, fig. 1*).—This bulletin reports the crop results for the period of 1905–1918, inclusive, of a series of field experiments begun in 1894 to ascertain the value of sodium as an entire or partial substitute for potassium and previously noted from time to time (E. S. R., 18, p. 1113; 21, p. 224; 29, p. 419). Sodium and potassium were applied in various amounts, both as carbonates and chlorids and in connection with different amounts of lime. Nitrogen and phosphorus were applied equally to all plats, usually in such amounts as to render potassium the only deficient element. The crop data are presented in tabular form, and include information on the effect of the different treatments upon flat turnips, radishes, rutabagas, table beets, cucumbers, buckwheat, cabbage, sugar beets, mangels, oats, hay, onions, carrots, rape, and potatoes. The results secured may be summarized as follows:

Where an insufficiency of potassium occurred, sodium was generally useful, confirming earlier work with water cultures of cereal seedlings, which likewise showed that when potassium was deficient sodium became beneficial. It was commonly observed that if in the absence of sodium a depression of 30 per cent in the growth of the seedlings was caused by partially withholding potassium, the growth was not depressed more than half as much in a similar culture to which sodium was added, indicating a direct beneficial action of sodium, for under the conditions of the experiment it could not liberate potassium. In the field, however, more potassium was removed in the larger crops which usually resulted when sodium was increased in connection with an insufficient amount of potassium, in spite of the fact that sodium frequently decreased the percentage of potassium in the crop. A portion of the benefits arising from the use of sodium in the field is, therefore, believed to be due to indirect action, although the culture solutions indicate that direct beneficial effects were also probably obtained in the field. The yield in grains due to sodium are deemed sufficient to

merit careful consideration at the present time of the utilization of our liberal supply of sodium salts as economic supplements to a limited amount of potassium.

**Relation of sulphates to plant growth and composition**, H. G. MILLER (*Jour. Agr. Research [U. S.], 17 (1919), No. 3, pp. 87–102, pls. 4*).—In this contribution from the Oregon Experiment Station it is reported that "pot experiments to show the effect of sulphur fertilizers—namely, sodium sulphate, calcium sulphate, and sulphur on red clover, rape, and oats were carried on with three different soils, including one with a high sulphur content, one that did not respond to elemental sulphur in the field, and one that did.

"To eliminate the sulphur compounds acting upon the insoluble plant food and soil organisms these plants were also grown on sand receiving the sterilized soil extract, and certain pots received the additional sulphur fertilizers as the soil. Sodium sulphate and calcium sulphate were added daily in solution form. The elemental sulphur was mixed with the soil and calcium carbonate at the time of sowing the seed. Sodium nitrate solution was added daily to eliminate available nitrogen as a limiting factor of growth, and also to determine what effect sulphates would have on nitrogen assimilation by the plant. The plants were grown for two and one-half months, and the dry weights of the tops were recorded. The total sulphur and nitrogen was determined in the majority of cases.

"Addition of sulphate and elemental sulphur enhanced the growth of the plants grown in pots in the greenhouse. The corresponding increases obtained on the soil extracts indicated that sulphur acted directly in promoting this growth. The great increase in the nitrogen content of the clover grown on the soil where sulphates had been added is the result in all probability of the sulphates stimulating the action of the legume bacteria. Sulphates caused increased root development and number of nodules on the clover grown in the soil pots."

A list of references to literature on the subject is given.

**Available fertilizer from smelter by-products**, P. J. O'GARA (*Proc. Wash. Irrig. Inst., 5 (1917), pp. 102–110*).—Experiments on the effects of sulphur dioxid on alkali soil and on crops showed that "(1) the water solubility of the alkali was lowered; (2) there was a reduction in carbonate; (3) there was an increase in sulphate; (4) there was an increase in available potash; (5) crops fumigated daily throughout their period of growth with sulphur dioxid in concentrations just below the toxic limit . . . showed either a slight gain, or at least no loss in total vegetable matter produced, as compared with check plats grown under identical conditions but not treated with sulphur dioxid; (6) the sulphur content of the plants was increased."

Field experiments with field and truck crops in which elemental sulphur was added at the rate of 400 lbs. and sulphuric acid at the rate of 2,172 lbs. per acre showed that as compared with untreated soils in check plats, the water solubility of the alkali was reduced about 20 per cent, while the availability of potash and phosphorus were increased approximately 20 per cent. The treated soils showed an increase in sulphate content, a decrease in carbonate content, and an increase in all crops grown.

"One of the striking effects of sulphur and sulphuric acid treatment of soils on the soil microorganisms is the decided and consistent increase in total bacteria as determined by the plate method. Under certain conditions in a period of three weeks the sulphur and sulphuric-acid-treated plats showed 50 per cent more microorganisms than did the untreated checks. The sulphur plats in general showed a greater increase in the number of organisms than did the sulphuric-acid-treated soils . . . In general the sulphur-treated plats

showed a greater increase in total vegetable matter produced than did the sulphuric-acid-treated plats as compared with the checks."

"The results so far obtained lead to the general conclusion that sulphur and sulphuric acid have a decidedly beneficial effect upon the soil flora."

**Lime requirements as determined by the plant and by the chemist**, B. L. HARTWELL, F. R. PEMBER, and L. P. HOWARD (*Soil Sci., 7 (1919), No. 4, pp. 279–282*).—Experiments conducted at the Rhode Island Experiment Station are reported in which surface soil, described in a previous and related report (E. S. R., 32, p. 622), was limed in amounts varying from 378 to 4,000 lbs. of calcium oxid per acre and planted to beets and lettuce. The basic nutrients were brought to optimum. The lime requirement of the soil was determined by the ammonia and Veitch methods before planting.

It was found that "in general after maximum crops had been attained by liming the soil still showed a lime requirement of about 5,000 lbs. In fact, the lettuce, although a crop which is very sensitive to 'soil acidity,' was depressed in growth when an application equivalent to 4,000 lbs. of calcium oxid was made to the limed nitrate of soda soil, and the subsequent lime requirements thereby reduced to 2,800. A carbon-dioxid determination made in this soil showed that not more than about 10 per cent of the added lime remained in carbonate at the end of the experiment. . . . The limed nitrate-of-soda soil had a lime requirement of 3,700 by the ammonia method, and yet not much advantage was derived from liming. When about this amount was added for lettuce there was less crop than where smaller amounts were used. And yet the Veitch method yielded even higher results than the ammonia method."

It is thought that the "elimination of the effect of the aluminum in acid soils seems likely to prove of more importance than the neutralization of the acidity, and attention should be given to methods of determining active aluminum while developing those for soil acidity."

**An artificial fertilizer**, A. GAUTIER and P. CLAUSMANN (*Sci. Amer. Sup. 88 (1919), No. 2275, p. 95*).—Pot experiments with plants grown on (1) a charcoal soil to which no fluorin had been added, (2) an artificially fluorated charcoal soil, and (3) ordinary garden soil showed that "of 12 species cultivated under similar conditions but with the addition or nonaddition of fluorid, the influence of the fluorin was favorable to 7 (cress, cabbage, California poppy, spinach, viper's bugloss, spurrey, and hemp); exerted no effect upon 3 (convolvulus, onion, and rye); while it produced inferior crops in 3 (sweet peas, chick-peas and centaury)."

These results are not considered entirely conclusive owing to the small size of the experiment and to the fact that potassium fluorid was used. Field experiments using other fluorids are to be reported later.

**Fertilizers in Cochin China**, P. BUSSY (*Bul. Agr. Inst. Sci. Saigon [Cochin China], 1 (1919), No. 2, pp. 40–51*).—The author discusses the fertilizers of animal, vegetable, and mineral origin which are adapted for use in Cochin China from the standpoint of availability, and gives analyses of some of the more important types, including fish waste, oil cake, bone meal, green manure, stable manure, bat guano, natural phosphate, and the common nitrogenous and potassic mineral fertilizers.

## AGRICULTURAL BOTANY.

**The biological normal spectrum**, C. RAUNKIÆR (*K. Danske Vidensk. Selsk., Biol. Meddel., 1 (1918), No. 4, pp. 17*).—This is an attempt to express mathematically the net results of conditions affecting the attainment of stability in

the make-up of the biological complex in any given region, and to obtain comparable expressions for the results of climatic and other factors as recorded in the life forms developing in any locality under natural conditions.

**Statistical studies on vegetative formations**, C. RAUNKIÆR (*K. Danske Vidensk. Selsk., Biol. Meddel., 1 (1918), No. 3, pp. 80*).—This contribution employs the term formation (for a fundamental unit to be used as a basis for classification and discussion of vegetations) in a way to correspond somewhat to the term species in classification of individual plants. It defines the term as a growth somewhat homogeneous as regards its composition and general character determined by the conditions of the environment, being a biological expression of such conditions. Several main sections deal with the degree of frequency of species as applied to floristic characterization of plant formations, the law of distribution of frequencies, utilization of the degree of frequency as a biological characteristic of formations, and the degree of covering of the soil by species as applied to physiognomic characterization of formations.

**The theory of limiting factors**, W. H. BROWN (*Philippine Jour. Sci., Sect. C, 13 (1918), No. 6, pp. 345–351, fig. 1*).—This is a critical review of Blackman's theory of limiting factors (E. S. R., 18, p. 923; 24, p. 533) and of facts and views contributed by other authors.

**The origination of ascidia under quasi-experimental conditions**, F. E. LLOYD (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 11 (1917), Sect. IV, pp. 71–80, figs. 4*).—The author describes the results of abnormal development in a large number of seedlings of *Gossypium herbaceum*, supposedly due to the mechanical pressure resulting from disharmonious growth. The plants were allowed to grow for over a year in 3-in. pots, during much of which time they were either dormant or growing under higher temperatures or more abundant watering than usual, finally settling down to a balance of activities scarcely sufficient to keep them alive. Such buds and shoots as formed were highly abnormal as regards form, the leaves produced remaining juvenile in character. It appears probable that the tendency to form ascidia is an abnormal expression of an attempt to form separate lobes. The malformations observed are not supposedly identical with tomosis.

**Alternate shrinkage and elongation of growing stems of Cestrum nocturnum**, W. H. BROWN and S. F. TRELEASE (*Philippine Jour. Sci., Sect. C, 13 (1918), No. 6, pp. 353–360*).—From among a number of rapidly growing plants in Manila which wilt during a comparatively dry summer day, the authors chose 2 plants of *C. nocturnum* as material for the study of this phenomenon. It was found that the shoots wilt regularly, frequently decreasing in length owing to excessive transpiration on every comparatively dry day, but regain their original length in the evening or night, after which they elongate rapidly.

**Algological notes.—III, A wood-penetrating alga, Gomontia lignicola n. sp.**, G. T. MOORE (*Ann. Missouri Bot. Gard., 5 (1918), No. 3, pp. 211–224, pls. 3*).—The author reports a study of an alga occurring partly on and partly within the tissues of a yellow-pine board submerged in fresh water. The organism is described as *G. lignicola* n. sp. Apparently the penetration of the wood was not a consequence of disintegration.

**A study of stomata**, L. REHFOUS ([*Trav.*] *Inst. Bot. Univ. Genève, 9. ser., No. 6 (1917), pp. 110, figs. 135; abs. in Rev. Gén. Bot., 30 (1918), No. 359, pp. 366, 367*).—This is a detailed account of studies on stomata in a large number of plant families, emphasis being placed on such minute details as number, arrangement, or cutinization of cells in relation with stomata. Descriptions are given of new stomatal types in Polypodium, Platycerium, Cycas, and Casuarina. A practical phase of the work is presented in connection with a possibility of detecting adulteration in such articles of commerce as drugs and tea. It is

thought also that these data may serve as a point of departure for studies in regard to means and results of adaptation by plants.

**The taxonomic position of the genus Actinomyces**, C. DRECHSLER (*Proc. Nat. Acad. Sci., 4 (1918), No. 8, pp. 221–224*).—This is a brief statement of the results of a study made by the author on a large number of saprophytic species of Actinomyces. The view that this genus should be regarded as a transition between Hyphomycetes and the Schizomycetes is regarded as not well supported by the facts at hand. The author prefers to class this genus with the Hyphomycetes as a mucedineous group with tendencies toward an erect isarioid habit.

**Morphology of the genus Actinomyces**, C. DRECHSLER (*Bot. Gaz., 67 (1919), Nos. 1, pp. 65–83; 2, pp. 147–168, pls. 8*).—The general conclusion drawn from this study is stated in the less detailed article noted above.

**A comparison of Azotobacter with yeasts**, M. MULVANIA (*Tennessee Sta. Bul. 122 (1919), pp. 3–6*).—The morphological resemblance of Azotobacter in many of its cytological forms to yeast cells has led the author to make a comparative study of the morphology and physiology of Azotobacter and certain yeasts. The results of this study are given in tabulated form, and in discussing them the author states that he is compelled to believe that the three members investigated belong in a single narrowly restricted group of organisms. The gas-producing quality was found to be confined to Azotobacter, but was never observed in either pink or white yeast. Other resemblances between Azotobacter and yeasts, as well as contrasts with true bacteria, are pointed out.

**The use of iron in nutrient solution for plants**, G. E. CORSON and A. L. BAKKE (*Proc. Iowa Acad. Sci., 24 (1917), pp. 477–482, figs. 4*).—A study of wheat and Canada field peas, germinated in clean quartz sand and grown in Shive's 3-salt solution (E. S. R., 34, p. 333) with a small proportion of iron compound, is said to show that the proportion of iron is more important than is generally supposed. Ferrous phosphate is less efficient than the ferric form, and wheat is more improved than the field pea by the presence of ferric phosphate at a concentration of 0.0044 gm. per liter.

**Relation of varying degrees of heat to the viability of seeds**, J. L. BURGESS (*Jour. Amer. Soc. Agron., 11 (1919), No. 3, pp. 118–120*).—Corn, wheat, oats, rye, cowpeas, soy beans, and garden beans were subjected to varying degrees of dry heat for different lengths of time in tests conducted at the North Carolina Department of Agriculture seed laboratory in an effort to ascertain the effect of high temperatures employed in the control of insect pests on the viability of the seed.

While the results as a whole are deemed rather unsatisfactory, the minimum temperature used, 140° F., as well as much higher temperatures in certain instances, failed to show any harmful effect on the viability of garden beans, soy beans, oats, and rye. Corn and wheat were seriously injured at temperatures above 150°, while data are lacking as to the effect of lower temperatures. Cowpeas appeared to withstand fairly well heating to 140° for one hour.

**Some additional notes on pollination of red clover**, L. H. PAMMEL and L. A. KENOYER (*Proc. Iowa Acad. Sci., 24 (1917), pp. 357–366*).—Noting more recent work than that formerly participated in by one of them (E. S. R., 31, p. 134), the authors report that while honeybees do not appear to be active pollinators of red clover they do appear to be able to effect limited pollination during certain seasons.

**Studies on self-sterility.—II, Pollen tube growth**, E. M. EAST and J. B. PARK (*Genetics, 3 (1918), No. 4, pp. 353–366*).—This report deals with the phenomena outlined in the authors' account of work previously noted (E. S. R., 38, p. 823).

It is stated that pollen grains of the four species of Nicotiana employed herein, as previously, germinated freely on many artificial media as well as on the stigmas of the plants, but that they reached only a fraction of the length attained under normal conditions, the growth moreover being abnormal. The pollen tubes produced after selfing were five to ten times as numerous as required to fecundate the ovules. Pollen tubes after selfing are indistinguishable in size from those following a cross. Variations in length of pollen tubes after self-pollination and cross-pollination seem to be due wholly to differences in the rate of germination of the pollen grains or to environment. Pollen tubes produced after self-pollination grow at a uniform rate, and to all appearances normally, but too slowly to reach the ovary before the flower decays. After a compatible cross the growth of the pollen tube is rapid and accelerated. The corresponding curve when plotted suggests an autocatalytic reaction. Cross-sterile combinations resemble selfings as regards rate of pollen tube growth. Near the end of the flowering season the rate of growth of self-pollen tubes becomes more rapid, though little evidence has been obtained of acceleration during their passage down the style.

These results are thought to show that pollen tubes in a selfed pistil are not inhibited in their growth by substances secreted in that pistil, but that substances are secreted in the pistil after a compatible cross which accelerate growth. The direct cause of this secretion is a catalyzer, which the pollen-tube nucleus is able to produce because the zygotic constitution of the plant producing it is different in certain particular hereditary factors from that of the plant on which it is placed.

**The behavior of the chromosomes in fertilization**, K. Sax (*Genetics, 3 (1918), No. 4, pp. 309–327, pls. 2*).—The purpose of this study was to consider not only the behavior of the chromosomes of the gametic nuclei, but also in the triple fusion, which is considered as comparable to the union of the gametic nuclei so far as inheritance of endosperm characters is involved. The material was obtained from about 4,000 cases of fertilization in *Fritillaria pudica* and 200 in *Triticum durum hordeiforme*, both of which furnish a complete series of stages in the first division of the fertilized egg. The behavior observed in each of these plants is detailed with discussion.

**The segregation of Œnothera brevistylis from crosses with Œ. lamarckiana**, B. M. Davis (*Genetics, 3 (1918), No. 6, pp. 501–533, figs. 7*).—An account of studies carried on during 1916 and 1917 with species of *Œ. brevistylis* and *Œ. lamarckiana* and their crosses, direct and reciprocal, is given with results which are tabulated and discussed.

It is stated that the $F_1$ generations of reciprocal crosses between these plants are uniform and essentially indistinguishable one from another. The $F_2$ generations from reciprocal $F_1$ hybrids present a perfectly sharp segregation of *brevistylis* plants from *lamarckiana* in proportions approximating the monohybrid Mendelian ratio of 1:3, the distinguishing characters of *brevistylis* being inherited in closely associated relations (behaving as a unit). Other observations are detailed with discussion. The breeding data indicate that crosses between *brevistylis* and *lamarckiana* result in a simple monohybrid situation.

**Twin hybrids of Œnothera hookeri**, H. de Vries (*Genetics, 3 (1918), No. 5, pp. 397–421*).—Having been convinced by recent studies cited that lethal factors and hybrid mutants play a considerable part in the splitting phenomena which accompany the normal mutations of many species of Œnothera, the author outlines the steps leading to this view and studies in connection therewith.

Summarizing the data and conclusions of this work, he states that *Œ. hookeri* produces a splitting *lata* and a uniform *velutina* in its crosses with *Œ. grandi-*

*flora*, just as in those with *Œ. lamarckiana*. This production of twin hybrids is due to the mass mutation of *Œ. grandiflora* into *Œ. grandiflora ochracea*, the typical gametes producing the *velutina*, whereas the mutated ones give rise to the *lata*. The fact that there is almost complete analogy between the twins of *Œ. lamarckiana* and those of *Œ. grandiflora* is considered as evidence of a mass mutation into a *velutina*-producting mutant for *Œ. lamarckiana*.

Splitting *lata* and splitting *rubiennis* have been produced only by three large-flowered races, namely, two Californian species, *Œ. hookeri* and *Œ. franciscana*, and *Œ. lamarckiana velutina*. In a large number of other cases the hybrids of the Œnotheras, whether twins or monotypic, are constant in their progeny, apart from the rare cases of Mendelian splitting. The *lata* and *rubiennis* always split into two types, one of which repeats their marks whereas the second resembles the other grandparent. No constant specimens of *lata* or *rubiennis* have been found among them.

**Merrillia, a new rutaceous genus of the tribe Citreæ from the Malay Peninsula**, W. T. SWINGLE (*Philippine Jour. Sci., Sect. C, 13 (1918), No. 6, pp 335–343, pls. 2*).—Six genera (9 species) of citrus plants containing what are supposed to be the surviving representatives of a once larger group, and now ranging widely in eastern tropical regions, are treated as comprising a natural group inside the tribe Citreæ, namely (subtribe) Balsamocitrinæ. The Katinga of Siam and the Malay Peninsula is assigned to this group, being the sole representative of the genus newly erected to receive this form (perhaps the most remarkably aberrant of the citrus fruits), which is described under the name *Merrillia caloxylon*.

## FIELD CROPS.

**Field technique in determining yields of experimental plats by the square-yard method**, A. C. ARNY and F. H. STEINMETZ (*Jour. Amer. Soc. Agron., 11 (1919), No. 3, pp. 81–106, figs. 3*).—This paper, a contribution from the Minnesota Experiment Station, deals with more extensive observations along lines described by Arny and Garber in a previous article (E. S. R., 40, p. 623), together with a discussion of a method equally well adapted to sampling broadcasted and drilled forages and grains on experimental plats. The work was conducted on variously treated tenth-acre fertilizer plats of barley, wheat, oats, and rye on University Farm and on outlying experiment fields located at Waseca, Morris, Grand Rapids, and Duluth. Ten square yard areas of the standing grain were harvested from each plat shortly before harvesting the entire plat. The areas were located not less than 7 ft. within the plat from sides and ends. The yield of grain in grams was ascertained for each square yard, and various combinations of square-yard areas compared with the yield secured by harvesting the entire plat.

A comparison of the probable error for single determinations of the yields from entire plats and from square-yard areas removed from them led to the conclusion that "from relatively uniform standing grain 4 to 5 systematically distributed square-yard areas removed from tenth-acre plats gave approximately the same probable error for yield as harvesting the products of entire plats; and the probable error for the yield from 10 square-yard areas removed from tenth-acre plats was approximately two-thirds that for the tenth-acre plats from which the square yards were removed. Where the stands of grain were relatively nonuniform, 5 to 10 systematically distributed square-yard areas were necessary to reduce the probable errors to approximately equal those for the yields from the tenth-acre plats from which the square-yard areas were removed. These results are strictly applicable for the seasons of 1918 and 1917

to the plats on the series mentioned. It appears, however, that where determinations are sufficiently large in number and are made covering varying conditions of soil and climate, probable errors for areas of given size are very similar."

Tabulated data are presented and discussed comparing the increases in yield following the different fertilizer treatments on the various experiment fields as ascertained by the tenth-acre plat and the square-yard methods, together with data showing the yields secured from the entire tenth-acre plats and from the square-yard areas removed from them. The effect on yields of alleys along the sides of plats and of cultivated roadways at the ends, as indicated by investigations described by Arny and Hayes (E. S. R., 40, p. 226), is pointed out, and the statement made that the yield of entire plats subject to this effect should ordinarily be about 5 to 10 per cent higher than that of square-yard areas not subject to border effect. The cost of removing 10 square-yard areas from a tenth-acre plat, thrashing, and weighing the product is said to be approximately the same as for harvesting the entire area with the binder, thrashing the grain with the ordinary thrashing machine, and weighing the product.

The authors conclude that "the variations in the calculated probable error for the yield determinations at the different locations emphasizes the desirability of deriving probable error for use in the interpretation of the results of each test. The pairing method may be used to advantage in deriving probable error where the yields from a sufficient number of check plats is not available for this purpose. Yields determined from 4 to 5 systematically distributed square-yard areas removed from plats one-tenth acre in size or less of relatively uniform crop may be confidently substituted for those from the entire plats. Under similar circumstances the yields from a greater number of square-yard areas may be considered more accurate than those from the entire plats. From very nonuniform crops the yield from 10 square-yard areas systematically distributed may not be as accurate as the yields from the entire plats. The method of determining yields by the removal of relatively small systematically distributed areas, square yards or rod rows, from plats may be used to advantage: (a) Where facilities for making yield determinations from entire plats are lacking, (b) to check the accuracy of yield determinations on plats, [and] (c) where more accurate determinations of yield are desired than can be secured from the limited number of larger plats that can ordinarily be devoted to a series of tests."

[Report of field crops work in Nebraska] (*Nebraska Sta. Rpt. 1918, pp. 21, 22–24*).—This briefly describes work conducted during 1918 on the North Platte, Scottsbluff, and Valentine substations.

The average yield of spring wheat at North Platte was 8.9 bu. per acre, and of winter wheat 7 bu. per acre, although most of the latter was winterkilled. Spring wheat following summer tillage produced 17.5 bu., as compared with 3.7 bu. under continuous cropping. Winter wheat following corn produced 5.6 bu., and after summer tillage 19 bu. Without irrigation potatoes yielded 84.5 bu. per acre, corn for silage 4.5 tons, and winter wheat 8.3 bu., as compared with 135 bu., 9.1 tons, and 26.2 bu. per acre, respectively, with irrigation.

Observations on irrigated crop rotations at Scottsbluff showed that low yields followed continuous cropping; that poor grade and extremely scabby potatoes were secured from short rotations; that fall seeding of alfalfa in grain stubble gave better results than seeding alone in the spring except during seasons when grasshoppers were bad, when early spring seeding is deemed preferable; that barnyard manure was beneficial; and that there was a marked residual effect from alfalfa. Sugar beets grown on manured plats produced at the rate of 21.3

tons per acre as compared with 14.3 tons without manure. Commercial fertilizers have not materially increased the yield of sugar beets.

Thinning sugar beets on June 8, 18, and 22 resulted in yields amounting to 19.26, 19.02, and 15.83 tons per acre, respectively. Potatoes grown on alfalfa land produced more than twice as much as when grown on land never planted to alfalfa. Plowing corn land failed to show any advantage over disking for either oats or barley. In a comparison of pasture crops sweet clover is said to be more promising than any of the grasses tested. It is recommended that sweet clover be sown in the spring with a grain crop and irrigated sufficiently to furnish some pasture the first summer.

Corn gave the best results of the forage crops tested at the Valentine substation. Early seedings of sweet clover (about April 7) gave good results, while alfalfa failed with all seedings made before May 10. Potatoes grown on heavy, unmulched soil from seed produced under mulch showed an increase in yield of 20 per cent over those from seed grown by ordinary methods. The Pinto bean appeared to be more drought resistant than any of the other varieties tested.

**Soy beans and cowpeas for North Carolina**, V. R. HERMAN (*North Carolina Sta. Bul. 241 (1919), pp. 7–40, figs. 10*).—This bulletin reports results of cultural, fertilizer, and variety tests with soy beans and cowpeas conducted at various points in the State in cooperation with the U. S. Department of Agriculture, together with a discussion of the adaptability and utilization of the two crops in North Carolina.

**A five-year rotation of potatoes, rye straw and squashes, onions, oats and rowen, and hay**, S. C. DAMON (*Rhode Island Sta. Bul. 178 (1919), pp. 4–16*).—This bulletin comprises a report on the crop yields, the fertilizer ingredients applied and removed, and the total cost, value, and net returns of the various crops in a 5-year rotation, previously described (E. S. R., 36, p. 528), for the period of 1893 to 1916, inclusive.

It is concluded that "a definite rotation with liberal fertilization and careful cultivation, followed for a long period, results in increased fertility in the soil and in a reasonable profit." The average profit per acre for the different crops was estimated to be as follows: Potatoes, $31.30; rye straw, $10.43; squashes, $13.69; peas (grown for 11 years), $65.58; turnips (grown for 11 years), $19.85; onions (grown for 13 years), $100; oats, $7.77; and hay and rowen, $7.52.

**The varieties of small grains and the market classes of wheat in Utah**, G. STEWART (*Jour. Amer. Soc. Agron., 11 (1919), No. 4, pp. 163–169*).—This paper, a contribution from the Utah Experiment Station, presents the results of a field survey made in 1918 in an effort to ascertain what varieties of wheat, oats, and barley are grown in the State. Samples of these cereals were collected from all available local sources and grown at Logan for identification. Results secured by the Utah-Idaho Grain Exchange in the market grading of wheat for the year ended July 31, 1918, are also briefly reviewed.

These studies are held to indicate that the varieties of small grains grown in Utah are badly mixed, and that varietal names are frequently misapplied. The commonest varieties of wheat and those deemed best adapted include Dicklow and New Zealand for irrigated farms, and Turkey, Kofod, Bluestem, and Gold Coin for dry-land farms. Oats are practically standardized to Swedish Select. Market grades substantiate the results of the field survey, 44 per cent of the wheat graded falling in the class of mixed wheat, while other reductions in grade, due to different factors, are considerable.

**Carrying capacity of native range grasses in North Dakota**, J. H. SHEPPERD (*Jour. Amer. Soc. Agron., 11 (1919), No. 4, pp. 129–142, pls. 3, fig. 1*).—This paper reports the progress of grazing experiments, conducted by the North Dakota Experiment Station in cooperation with the U. S. Department of Agri-

culture near Mandan, in which an effort is being made to determine the carrying capacity of native range pastures without regard to their maintenance or improvement. Two-year-old grade beef-bred range steers, comprising Shorthorn, Angus, and Hereford grade and crossbred cattle, have been adopted as the grazing unit and studies made of pasturing ratios of 3, 5, 7, and 10 acres of grass area per steer. The work was begun in 1915 when the entire area of 250 acres was grazed as one pasture. In 1916 the area was divided into 30, 50, 70, and 100 acre pastures, each grazed by ten 2-year-old steers or their equivalent. By means of quadrats 20 by 300 ft. fenced off in the 30 and the 100 acre pastures, information has been secured relative to the dominant, primary, and secondary species of grasses and of plants other than grasses occurring in the different pastures. Perquadrats 4 meters square (about 19.14 sq. yds.) are opened for grazing each year and a similar perquadrat taken in from the pasture. Population studies of these areas for ten years are expected to furnish data concerning the flora of areas grazed from one to ten years.

The 1918 results are given in some detail, and summarized statements presented for the whole period of the experiment showing the average gains per head, per day, and per acre for the different pasture ratios, and the gains per day for different grazing periods. It is stated that although the results are not yet regarded as conclusive they indicate that less than 7 acres of native range pasture per 2-year-old steer is insufficient, that the principal gains are made by cattle during the early part of the grazing season, that late season grazing is done without gains, if not at an actual loss in weight, and that "the number of acres supplied per steer in practice will depend upon the farm management questions of the cost of supplementing pastures and the price of land used for grazing, as heavy early season pasturing gives maximum per acre yields."

**Baling hay**, H. B. McClure (*U. S. Dept. Agr., Farmers' Bul. 1049 (1919), pp. 34, figs. 8*).—Various types of hay presses and their operation are described, and farm practices conducive to maximum efficiency in baling hay indicated.

**Alfalfa on corn belt farms**, J. A. Drake, J. C. Rundles, and R. D. Jennings (*U. S. Dept. Agr., Farmers' Bul. 1021 (1919), pp. 32, figs. 16*).—Based on information secured from 235 farms in Ohio, Indiana, Illinois, and Iowa, where alfalfa was found to be grown successfully, this publication discusses the cropping systems and the methods of handling the crop employed by experienced corn belt growers to overcome the labor conflict between alfalfa and corn.

The principal means of attaining this end is said to comprise the speeding up of the haying operations and corn cultivation by the utilization of labor-saving devices and more efficient management. The use of alfalfa for pasture has also aided to some extent.

**Alfalfa in Michigan**, J. F. Cox (*Michigan Sta. Spec. Bul. 97 (1919), pp. 3–16, figs. 7*).—Field practices and cultural methods employed in growing the crop in the State are described.

**Barley culture in South Dakota**, M. Champlin, J. D. Morrison, and J. Martin (*South Dakota Sta. Bul. 183 (1919), pp. 11–69, figs. 14*).—This bulletin describes variety and cultural tests with barley conducted in cooperation with the U. S. Department of Agriculture at Brookings, Cottonwood, Eureka, Highmore, and Newell, over a period of several years. The crop is said to rank fourth among the cereal crops of the State. The results secured may be summarized as follows:

In general, barley has produced more food per acre than other small-grain crops, although there have been some notable exceptions. No advantage was found in growing barley in mixtures with oats or emmer. Odessa (S. D. 182) is said to have given good results in all parts of the State where tried and is

recommended as a general purpose variety for the State as a whole, while other varieties are recommended for special conditions. Rust, smut, ergot, stripe disease, and blight are regarded as among the important barley diseases, while control measures include early seeding, seed disinfection and grading, and the rotation of crops.

Barley responded readily to good rotation methods. It is recommended that a firm seed bed be prepared with a shallow mulch. Early seeding is deemed very important. Six pecks per acre was found to be the best rate of seeding in general, and the proper depth of seeding about 2 in. Seeding with a drill is recommended.

It is stated that barley can be grown as a cultivated crop to good advantage in sections where corn is not a highly profitable crop. Careful shocking and stacking is strongly advised in order to secure grain of good market quality.

**A reason for the contradictory results in corn experiments.** L. CARRIER (*Jour. Amer. Soc. Agron., 11 (1919), No. 5, pp. 106–115*).—In this paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the author discusses briefly the unreliability of the common methods of variety and ear-to-row testing of corn whereby the influence of the pollen on the size and yield of grain is overlooked, although this factor may affect the results as much or more than inherent differences in the corn under examination. It is suggested that the farmer be advised to continue to select seed corn conforming to the well established types of the locality and occasionally to introduce some seed from an outside source, preferably of the same variety, but not closely related to his own strain.

Finally it is stated that "corn still offers great opportunities to the agronomist who will break away from the old methods of conducting experiments and work in the light of all the known facts regarding this crop. A method must be followed which will allow the plants to develop normally and at the same time effectually control the matter of pollination. The equipment for such experiments will be expensive, but relatively no more so than that used in lysimeter and some other work. The importance of the corn crop would seem to justify any such outlay of public funds."

**Some factor relations in maize with reference to linkage.** D. F. JONES and C. A. GALLASTEGUI (*Amer. Nat., 53 (1919), No. 626, pp. 237–248*).—The authors describe what they consider to be "a fairly good case of linkage between the tunicate factor which determines the production or inhibition of the glumes covering the seeds and the factor for starchy or sweet endosperm," and discuss evidence secured by other investigators relative to linkage in corn.

A half-tunicate ear produced from open-pollinated seed of a perfect flowered segregate was self-pollinated. Upon examination this ear was found to have segregated into 173 starchy and 43 sweet seeds. Assuming linkage, a classification of $F_2$ progeny into starchy tunicate, starchy nontunicate, sweet tunicate, and sweet nontunicate plants is said to agree rather closely with the nearest theoretical results. Observations on the progeny of a similar ear crossed with a yellow, starchy, nontunicate corn is said to show no indication of linkage between the factors for tunicate ear and yellow endosperm.

It is stated further that "since the number of known factor differences in maize is already some three or four times the number of chromosomes, more definite knowledge of the behavior of all these factors in relation to each other will be awaited with interest, especially since maize is one of the best materials from the plant side to which the chromosome hypothesis, as worked out in Drosophila, can look for contradiction or support."

**Structure of the maize ear as indicated in Zea-Euchlæna hybrids.** G. N. COLLINS (*Jour. Agr. Research [U. S.], 17 (1919), No. 3, pp. 127–135, pls. 3, fig.*

*D*).—In this paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the author describes observations made on hybrids derived largely from a cross between Florida teosinte and Tom Thumb popcorn in an effort to throw some light on the morphology of the maize ear, together with a possible explanation of its evolution. Six $F_1$ plants were grown, and from the self-fertilized seed of one of these 127 $F_2$ plants were produced. Several hundred $F_3$ plants from open pollinated seed were also examined.

In order to make a detailed comparison of the pistillate inflorescences of Zea and Euchlæna, it was deemed necessary to recognize as a morphological unit the organs borne by a single metamer of the rachis, this unit being designated as an alicole. The single spikelets, two-ranked alicoles, and separate alicoles of the pistillate inflorescence of Euchlæna were then contrasted with the paired spikelets, many-ranked alicoles, and yoked alicoles of the pistillate inflorescence of Zea. The stages between the Euchlæna spike and the Zea ear as observed in hybrids between the two genera are summarized as follows:

"The suppressed pedicelled spikelet in each alicole reappears. The alicoles become more crowded and their number is increased. The alicoles associate themselves in pairs or yokes. The axis twists, increasing the row of alicoles. The order in which these changes occur is by no means fixed, but taken together they comprise all the changes necessary in deriving the maize ear from the Euchlæna spike.

"In this series of intermediate stages nothing was observed that affords support for either the fasciation or 'reduced branch' theory of ear formation. There is also evidence from the maize ear itself that the association of alicoles into pairs is more fundamental than the linear arrangement.

"In all the hybrids between maize and Euchlæna that have been observed there has appeared no suggestion of either pod corn or *Zea ramosa*. Since it can scarcely be doubted that the peculiar characteristics of both of these mutations represent the reappearance of ancestral characters common to the Andropogoneæ, it would seem that in crossing maize and Euchlæna, and thus calling forth a series of intermediate forms, we are not returning to the point in the ancestry of maize where it became differentiated from the Andropogoneæ. Furthermore, if the stages shown in the hybrid plants were to be taken as indicating the path of evolution of the ear, it would be necessary to assume that the central spike of the staminate inflorescence or tassel had evolved separately and along different lines. The close homology between the ear and the central spike of the tassel makes such an assumption unreasonable.

"In the present article emphasis has been placed on the shortening and twisting of the axis of a single spike as a possible method of deriving a structure like the maize ear from the inflorescence of Euchlæna. This has been done, not because the method is believed to represent the most probable course of evolution, but because the present discussion has been restricted to the evidence afforded by hybrids of maize and Euchlæna, which seems to require such an interpretation. Facts of other kinds are more easily interpreted by the theories of fasciation and reduction of branches, but there are also facts that do not seem to accord with any of the theories yet proposed. Until the apparently contradictory evidence can be reconciled, it seems best to keep the several possibilities in mind and await additional evidence before attempting a complete interpretation."

Inheritance of waxy endosperm in maize, J. H. Kempton (*U. S. Dept. Agr. Bul. 754 (1919), pp. 99, figs. 14*).—This bulletin describes the results of investigations begun in 1910 in a further effort to study the correlation between endosperm texture and the color of the aleurone. A series of crosses were made between the white Chinese variety of corn having waxy endosperm

described by Collins (E. S. R., 22, p. 443) and an African popcorn. While the results are said to be similar, on the whole, to those previously reported, such large numbers of individuals were examined as to place the deviations from the expected ratios beyond question and to establish more definitely the existence of a correlation between the characters studied. The evidence is also believed to be of value in testing the general applicability of current theories of the segregation or alternative inheritance of characters, as well as theories that may be advanced in the future. Considerable tabulated data from which the pedigrees may be readily traced are presented and fully discussed. The author summarizes the results secured as follows:

"The number of seeds with the waxy endosperm reappearing in the perjugate generation of waxy×horny crosses is less than the expected for a simple Mendelian character, but this deviation, though significant, is too small to warrant the predication of additional factors. In making this determination, more than 100,000 seeds were classified, and it has been possible therefore to establish the actual percentage within 0.3 per cent. The same material was used to test the inheritance of aleurone color, which also was found to depart from the theoretical ratios. Unlike the waxy endosperm texture, no definite trend above or below the expected ratios was observed, but many abnormal ratios were obtained which necessitated further refinements in the factorial analysis of this character.

"From the results of the Mendelian analysis of aleurone color and endosperm texture it must be concluded that in many cases uniform Mendelian reactions are obtained, which allow certain predictions to be made with respect to the behavior of these characters in subsequent generations. But that these predictions, based upon the gametic analysis will be uniformly fulfilled must not be supposed. . . . Aberrant behavior is far from uncommon, increasing with the progress of investigation and the refinement of analysis. The fact is coming to be appreciated that instead of a few simple unassociated factors most characters are composed of many complex units, which may no longer be considered singly, but that their interrelations or correlations must be taken into account.

"The present investigations show that certain of the more definitely alternative characters of maize are subject to variation or fluctuating behavior that renders these supposed Mendelian factors too irregular to justify a belief that the very definite relationship predicted in theories of gametic coupling could exist between such characters. There can be little doubt, however, that at least with several combinations of characters the gametic ratios are to a certain extent regular, but that these ratios fit any arbitrary series is not so well demonstrated. For the breeder of crop plants where most of the desired characters are almost infinitely complex, seldom alternative, and often intangible, Mendelism seems to have little of practical value to offer, whether the attempt of some investigators to so extend the theory as to embrace such characters be approved or not. While Mendelism may assist in making desired combinations, there is nothing to show that it can serve as a substitute for selection either in finding the best stocks or in preserving them from subsequent deterioration."

**Factors influencing the carrying qualities of American export corn,** E. G. Boerner (*U. S. Dept. Agr. Bul. 764 (1919), pp. 99, figs. 72*).—In a continuation of investigations previously noted (E. S. R., 23, p. 35), this bulletin describes observations made on eight representative cargoes of corn accompanied from the United States to various European ports, and on an additional cargo which was carefully sampled at the time of loading in America and again at the time of discharge in Europe. The purpose was to determine the effect upon the carrying qualities of export corn of the moisture content, quality, and condition

of the corn as loaded, the length of the voyage, the season of the year, the weather conditions during shipment, and the position of the cargo in the vessel. Daily observations and tests were made of those cargoes accompanied to Europe from the time the corn was put into the vessels until it was discharged, electrical-resistance thermometers being placed at definite points in the cargo at the time of loading. As the thermometers were put in place, 3-qt. samples of corn were taken from the grain surrounding each thermometer with which to determine changes in the quality and condition of the corn during the voyage. One-half of each sample was retained for analyses, and the remainder was placed in a crossed wire container fastened to the thermometer and recovered as the corn was unloaded. Information concerning the studies made on each cargo is presented in considerable detail supplemented by tabulated data, diagrams, and graphs. The results may be summarized as follows:

Corn which was dry and in a sound condition when shipped arrived in Europe in a like sound condition, regardless of the position in which it was stowed, the time of year in which it was shipped, or the length of the ocean voyage. The higher the percentage of moisture in the corn when shipped, the greater was the danger of spoilage during the voyage. Various contributing factors also worked with the moisture in causing spoilage, a combination of two or more such factors resulting in much greater spoilage than one factor alone.

"It may reasonably be expected in other export shipments, if the quality and condition of the corn and the shipping conditions are similar to those found in the nine cargoes described, that the quality and condition of the corn on arrival at European ports will be the same as in those cargoes. As the quality, condition, and temperature of corn to be exported can be determined before it is delivered on board the vessel, and as the season of the year during which shipment is to be made, the place of stowage, and the probable length of voyage are known or can be ascertained, an estimate of the condition of the corn on arrival can be made in advance."

**Community cotton improvement in North Carolina, R. Y. Winters** (*Jour. Amer. Soc. Agron., 11 (1919), No. 3, pp. 121–124*).—This paper, a contribution from the North Carolina Extension Service, briefly outlines the methods employed and some of the results secured in community cotton improvement work inaugurated in the State in 1914. It is stated that 16 communities in 11 counties have been organized for this purpose, and that during the past three years good strains of cotton have been introduced which have produced an income of from $10 to $60 per acre more than the varieties previously grown in the community.

**Potato seed certification in New Hampshire, F. S. Prince** (*New Hampshire Sta. Circ. 19 (1918), pp. 3–10*).—The advantages of potato seed certification are discussed and the requirements for certification in the State outlined as approved by the New Hampshire Potato Growers' Association.

**The effect of the environment on the loss of weight and germination of seed potatoes during storage, O. Butler** (*Jour. Amer. Soc. Agron., 11 (1919), No. 3, pp. 114–118*).—A study of the effect of temperature, oxygen supply, and humidity on the germination and loss of weight of stored seed potatoes conducted at the New Hampshire Experiment Station led to the conclusion that germination can be satisfactorily retarded by lowering the temperature to 3.74° C. (38.7° F.), or by reducing the oxygen supply to a point corresponding to storage in "dead air"; that germination can be more effectively retarded by storage in "dead air" at a mean temperature of 9.31° than by storage in free air at 3.74°; and that loss of weight is markedly affected by the relative humidity of the air, saturated air and dry air both to be avoided.

**Gigantism in Nicotiana tabacum and its alternative inheritance**, H. A. ALLARD (*Amer. Nat., 53 (1919, No. 626, pp. 218–233)*.—The occurrence of giant or mammoth tobacco plants, having an abnormally high leaf number and possessing a vegetative period of such length as to preclude normal blossoming in the field, is described. This form is said to have appeared in different commercial varieties, including the Maryland, Cuban, Connecticut Havana, and Sumatra types, as well as in certain varietal and species crosses. Observations on the possibilities of combining the mammoth character with other characters of commercial value by crossing mammoth types with common varieties are described in the present paper. The behavior of a number of such crosses and the appearance and behavior of a new mammoth type in a line originating from a species hybrid are discussed in some detail.

In summarizing the results it is stated that "not only giant or mammoth types which breed true, but intermediate or hybrid types occur spontaneously which subsequently give rise to a greater or less proportion of mammoth forms." In crosses with normal varieties gigantism behaved as a recessive unit character, appearing in the $F_2$ in the expected 3:1 ratio. $F_1$ plants are said to have blossomed invariably and to have exhibited a somewhat higher average number of leaves than the normal parent entering into the cross.

**The Mendelian behavior of aurea character in a cross between two varieties of Nicotiana rustica**, H. A. ALLARD (*Amer. Nat., 53 (1919), No. 626, pp. 234–238*).—The author records observations on the $F_1$, $F_2$, and $F_3$ progeny of crosses between a distinctive white-stemmed and a green-stemmed type of *N. rustica*, begun at Arlington, Va., in 1914, together with the behavior of certain back crosses. The term "aurea" is applied to a peculiar varietal form of chlorosis characteristic of a light, yellowish-green type of *N. rustica*, having white stems and midribs and introduced from Russia, where it is said to be grown commercially as a pipe and cigarette tobacco. "In this variety of *N. rustica*, the stems of young plants, especially if they have been somewhat etiolated by crowding, are almost snow white. A cross section of the stems of such plants one month old reveals the fact that this whiteness is not merely superficial, but extends entirely through the stems, whereas in green varieties of *N. rustica* the internal structure of the stems is green throughout. The cotyledons are decidedly chlorotic, and the leaves have a pale yellowish-green chlorotic appearance which becomes more marked as the plants approach maturity." The results secured may be summarized as follows:

In the $F_1$ the aurea type behaved as a simple recessive to the green-stemmed type, the $F_2$ plants segregating into green-stemmed and white-stemmed plants in approximately the expected ratio of 3:1. Some heterozygous individuals were found among the green plants and again segregated into green and aurea types in a 3:1 ratio. Extracted aurea recessives of the $F_2$ proved to be homozygous for the white character. Back crosses between a heterozygous $F_1$ and the dominant green type resulted in all green-stemmed plants, while in a similar back cross with the recessive aurea type the progeny consisted of green and aurea plants in about the expected 1:1 ratio.

**Tobacco growing in Ireland**, G. N. KELLER (*Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1917), No. 2, pp. 461–466; 18 (1918), No. 3, pp. 296–299; 19 (1919), No. 3, pp. 298–302*).—The progress of work previously noted (E. S. R., 36, p. 533) is briefly discussed for the seasons of 1916, 1917, and 1918.

**On the blooming and fertilization of wheat flowers**, C. E. LEIGHTY and T. B. HUTCHESON (*Jour. Amer. Soc. Agron., 11 (1919), No. 4, pp. 143–162, figs. 2*).—The authors describe observations made at the Minnesota Experiment Station and the Arlington (Va.) Experiment Farm during the summer of 1914 on the

time of blooming of several varieties of wheat and on the fertilization of emasculated wheat flowers left unprotected from foreign pollination.

Different types of wheat, represented by Velvet Chaff, Haynes Bluestem, Glyndon Fife, Kubanka, Arnautka, Kharkov, and Turkey at St. Paul, and by Dietz, Fultz, Mealy, Giant Squarehead, Turkey, Bluestem, and Fife at Arlington, were examined for time of blooming. Individual heads were marked and a diagram prepared upon which the flowers were recorded as they bloomed. Examinations were made usually at 7 a. m., 12 m., and 5 or 6 p. m. A flower was considered as having bloomed when the glumes had opened appreciably. It is stated that "the process of blooming of a wheat flower is very rapid. From the time that they first begin to open the glumes may be fully open in less than 1 minute; the anthers may be extruded and emptied of pollen within 2 or 3 minutes; the glumes may be half closed within 5 minutes, loosely closed within 10 minutes, and tightly closed at the end of 15 or 20 minutes. The entire process, from the time that the first opening movement of the glumes can be observed until they are again tightly closed, seldom requires more than 20 minutes."

More frequent observations were also made at Arlington on 25 heads of wheat between 4 p. m., May 26, and 10 a. m., May 30, and on 10 heads between 2 p. m., June 1, and 3 p. m., June 5. Data secured at this time are held to indicate that the other records possess a high degree of reliability, and that while blooming occurred at most hours of the day it was most intense at rather definite periods.

Altogether the time of blooming was recorded for 2,977 flowers on 69 heads, 1,492 of these flowers blooming at night (from 5 or 6 p. m. to 7 or 8 a. m.), while 1,485 bloomed during the day. Of the latter, 764 bloomed before noon. At St. Paul 70 more flowers bloomed at night than during the day, while at Arlington 63 more bloomed during the day. The time of blooming appeared to depend to some extent upon the variety, although this is not regarded as the principal factor involved. Two periods of extensive blooming were observed during the day, a morning period from about 7 to 9, and an afternoon period from 2 or 3 to 4. A secondary morning period occurred about 11 o'clock. One or more periods are also said to occur at night or probably in the early morning, the exact time not being determined. The blooming period of the flowers on a wheat head ranged from 2 to 7 days, with an average of about 3 days. "The results of these observations should serve to correct the erroneous impression of many that wheat flowers always bloom very early in the morning (apparently true under some conditions) and that it is necessary to visit such plants at very early hours in order to secure opening anthers."

Flowers on a number of heads of several varieties of wheat were emasculated before the pollen matured and left without covering, while flowers on other heads of the same varieties were similarly treated but covered with soft tissue paper at St. Paul, and with paraffined paper bags at Arlington. The varieties employed in Minnesota for this work included Kharkov, Red Fife, Haynes Bluestem, Velvet Chaff, Glyndon Fife, Kubanka, and Arnautka, and at Arlington Fultz, Lancaster, C. I. Nos. 3614, 1733, and 1933, Tennessee Fultz, China, Early Genesee Giant, Acme, and Kanred. At the Minnesota Station kernels were formed by 507 of 1,240 flowers on 70 heads emasculated and left uncovered, while only 2 kernels were formed by 388 flowers emasculated and the heads covered. Where flowers were emasculated, pollinated, and the heads covered, 41.7 per cent formed seed. Kernels were formed by 1,103 flowers out of a total of 1,324 on 83 heads emasculated and left uncovered at Arlington. Only 6 kernels formed from 642 flowers on 40 heads emasculated and covered, 3 of these kernels being harvested under bags that had been torn. "When wheat flowers

are emasculated and not pollinated the glumes, apparently some time after the regular time of blooming, open and remain open for several days. The style also grows to an abnormal length. Opportunity is thus presented for the entrance of pollen. When fertilization has taken place the glumes remain closed. . . . In view of the results obtained in these experiments, there seems no doubt that in studies of inheritance in wheat hybrids and in breeding operations where hybrids of known parentage are desired it is necessary to protect emasculated flowers from undesired pollination."

**Dry farming for better wheat yields.—The Columbia and Snake River Basins**, B. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 1047 (1919), pp. 24, figs. 18*).—This publication comprises a general discussion of improved dry-farming methods found to give the best results on grain farms, with special reference to winter and spring wheat production in the Columbia and Snake River Basins, which have an annual rainfall of less than from 18 to 20 in. The recommendations are also deemed applicable to all farms in the region where summer fallowing is practiced.

It is stated that the early plowing and thorough cultivation of the summer fallow is imperative for the best results. The use of the summer fallow on "blow" and "nonblow" soils is described, and methods for preventing and stopping the blowing of soils are outlined.

**Seed Reporter** (*U. S. Dept. Agr., Seed Rptr., 2 (1919), No. 11, pp. 8, figs. 5; 3 (1919), No. 1, pp. 8*).—Both these numbers contain the usual statistics relative to forage-plant seeds permitted entry into the United States.

The first number also comprises a discussion of European seed conditions based on information furnished by A. J. Pieters, of the Bureau of Plant Industry, and Director Sorensen, of the Danish Seed Growers' Association; market notes for different sections of the country; reports on the sugar-beet seed, Bermuda-onion seed, and crimson-clover seed outlook; vegetable-seed crop conditions in California and the North Pacific division; data relative to commercial vegetable seed acreage and production, and wholesale and retail field seed selling prices as of April 30, 1919; and information on the total quantity of different varieties of velvet beans normally handled by wholesale and retail seedsmen in various southern States, together with the total quantity of the different sorts normally shipped out from producing sections by local shippers. Tentative seed production and consumption maps are presented, showing the counties normally producing a surplus, a sufficient, and an insufficient quantity of both crimson and white clover seed. Diagrams are also given showing the daily closing cash prices of "prime" seed of red and alsike clover and timothy on the Toledo market from September to April, inclusive, for the seasons of 1916–17, 1917–18, and 1918–19, respectively.

The second number contains articles on Some Factors That May Affect the Red Clover Seed Crop, by A. J. Pieters; Critical Studies in Seed Production, by R. A. Oakley; and Some Aspects of Seed Control, by W. A. Wheeler. Information is also presented relative to the outlook for seed of hairy vetch, orchard grass, redtop, meadow fescue, crimson clover, and Kentucky blue grass, together with notes on vegetable seed crop conditions, the production of onion sets near Chicago, and sources of field seeds for planting in the different States.

**Seed-testing [in New Zealand]**, E. B. LEVY (*Jour. Agr. [New Zeal.], 18 (1919), No. 3, pp. 129–139, figs. 9*).—The methods employed in conducting and reporting germination and purity tests at the seed-testing station of the New Zealand Department of Agriculture are described.

**Plants detrimental to agriculture: Botanical characteristics and methods of control**, G. FRON (*Plantes Nuisibles a l'Agriculture: Caracteres Botaniques et*

*Agricoles Methodes de Destruction. Paris: J. B. Bailliere & Sons, 1917, pp. 346, figs. 151*).—The work is divided into two parts, the first dealing in a general manner with weed growth and with the destruction of weeds, and the second part with brief descriptions of a large number of weeds arranged by families.

## HORTICULTURE.

**Protecting American crop plants against alien enemies,** B. T. Galloway (*Trans. Mass. Hort. Soc., 1919, pt. 1, pp. 75–87*).—A popular review, with discussion following, of the work of the U. S. Department of Agriculture in protecting American crop plants against the attack of foreign insects and diseases, including the main features of recent quarantine measures.

**Report of inspection service,** T. J. Headlee, M. T. Cook, and H. B. Weiss (*N. J. Dept. Agr. Bul. 6 (1917), pp. 199–213*).—A report for 1916 on the inspection for injurious insects and diseases of nurseries and nursery stock in New Jersey, as well as nursery stock shipped into New Jersey from foreign countries and other States.

**Analyses of insecticides and fungicides,** A. J. Patten and E. F. Berger (*Michigan Sta. Spec. Bul. 96 (1919), pp. 3–18*).—Analyses of samples of various insecticides and fungicides collected during 1917 and 1918 are reported. Special attention was given in 1917 to proprietary smut remedies and formaldehyde solutions, and in 1918 to commercial Bordeaux and Bordeaux-arsenate preparations.

**Judging vegetables,** A. H. McLennan (*Ontario Dept. Agr. Bul. 270 (1919), pp. 30, figs. 60*).—A set of standards is given for judging all the more important vegetables when placed on exhibition, including a table showing the number or quantity of each vegetable to make up an exhibit for judging and illustrations of various vegetables prepared for exhibition.

**[Variety tests of vegetables at Wisley in 1918]** (*Jour. Roy. Hort. Soc., 44 (1919), pp. 95–116*).—Results of tests conducted with a large number of stocks of runner beans, climbing French beans, leeks, and vegetable marrows at Wisley in 1918 are reported.

**Standardizing the hamper,** F. P. Downing (*Amer. Food Jour., 14 (1919), No. 7, pp. 9–12, figs. 3*).—This is the first of a series of articles in which the author is to consider the need of standardizing fruit and vegetable containers by Federal legislation. This article discusses present variations in the hamper basket and suggests proposed standards. Future articles are to deal with various other fruit and vegetable packages.

**Berry boxes and fruit baskets,** F. P. Downing (*West. Fruit Jobber, 6 (1919), No. 4, pp. 15–21, figs. 3*).—The author discusses some of the effects of Federal legislation providing for standard baskets or other containers for small fruits, berries, and vegetables; illustrates and describes the prevailing types of boxes and baskets; and recommends the elimination of a number of shapes now being manufactured. A table is given containing suggestive specifications for berry baskets and boxes.

**Utilization of refrigerating processes for the conservation, storage, and transportation of fruits,** Douane (*Bul. Mens. Off. Renseig. Agr. [Paris], 16 (1917), Apr.-June, pp. 229–251*).—A report on this subject to the French Commission for the organization and development of the fruit industry. The principal part of this report comprises the reproduction of an article by M. Pintaud, published in 1912, on the influence of artificial refrigeration on the fruit industry. In this article the selection of fruits for cold storage, as well as storage practices for various kinds of fruits and the history of refrigeration,

are considered. With this article as a basis, the author presents certain conclusions relative to refrigerative practices applicable to France.

**Varieties of fruits for various localities,** V. R. GARDNER (*Oreg. Countryman, 11 (1918), No. 2, pp. 18–21, fig. 1*).—A list of varieties of orchard and small fruits and grapes recommended for different sections of Oregon.

**A report on fruit growing in Denmark,** M. GRAM (*Tidsskr. Planteavl, 26 (1919), No. 1, pp. 80–185*).—A report on the development and present condition of fruit culture in Denmark, based on investigations made by the Commission on Fruit Culture under the direction of the State Commission for Plant Culture in 1917.

**Some observations on the pruning question,** H. S. REED (*Cal. Citrogr., 4 (1919), No. 10, pp. 258, 282, fig. 1*).—A contribution from the California Citrus substation, in which the author briefly discusses natural and artificial difficulties in solving the pruning question. The greatest natural obstacle, he points out, is the lack of fundamental knowledge of processes which take place within the tree. The work of Kraus and Kraybill dealing with the nitrogen and carbohydrate relations within the tomato plant (E. S. R., 40, p. 40) is cited as a step in the right direction. A serious artifical obstacle to successful pruning is the wholesale adoption of certain systems that, although giving success under a limited set of conditions, have not been thoroughly compared with other systems under varying conditions.

**Pruning and spraying the home orchard and vineyard,** G. M. BENTLEY (*Tennessee Sta. Bul. 121 (1918), pp. 19–47, figs. 50*).—Practical instructions on pruning and spraying, with special reference to the home orchard and vineyard.

**The commercial apple industry in the United States,** J. C. FOLGER (*Pure Products, 15 (1919), No. 8, pp. 380–386*).—A discussion of the commercial phases of the industry, including a brief description of the relative importance of different regions and the factors which influence their development.

**"P. J. Bergius," a new apple variety,** C. and R. FLORIN (*Acta Horti Bergiani [Stockholm], 6 (1918), No. 5, pp. 7, pl. 1, fig. 1*).—A red apple of dessert quality, which originated in the Bergielund fruit tree garden of the Royal Swedish Scientific Academy, is illustrated in color and described. The P. J. Bergius variety is a fall apple, and is believed to have originated as a bud sport from the Swedish variety Sävstaholm.

**Minimum temperatures sustained by apricots during March, 1919, in the Pecos Valley, N. Mex.,** C. HALLENBECK (*U. S. Mo. Weather Rev., 47 (1919), No. 4, p. 240*).—The author presents tabular data illustrating a remarkable resistance to temperatures below freezing after a period of low atmospheric humidity.

Apricot buds were showing pink on March 1, 1919, and were opening on March 3, 1919, and during the entire period, March 1 to March 19, inclusive, the blossoms were subjected to daily minimum temperatures below freezing with a temperature of 14° below freezing when in full blossom. On March 25 a thorough examination of the trees at different elevations showed less than 7 per cent of the fruit dead or injured. Inasmuch as the percentage of dead and injured fruit was not above normal it is not certain that this injury was caused by the cold.

On April 8, 1919, apples in the Pecos Valley were, when in full blossom, subjected to a snowstorm lasting 15 hours, during which the temperature was continuously below freezing, and below 30° F. in portions of the orchard district for several hours. Nevertheless, no noticeable damage was sustained to the fruit.

**Cover crops in the peach orchard,** C. A. MCCUE (*Delaware Sta. Bul. 120 (1918), pp. 3–31, fig. 1*).—Cover crop studies in peach orchards were started in

1909 and continued through 1917. The results secured each season are here reported in detail. A summary of the results in general has been previously noted (E. S. R., 41, p. 145).

**The culture of peach trees in the German climate**, F. RUDOLPH (*Die Freilandzucht des Pfirsichbaumes im deutschen Klima. Frankfort-on-the-Oder: Trowitsch & Son, 1918, 2. ed., rev. and enl., pp. X+84, figs. 35*).—A practical treatise on peach culture in Germany.

**Relation of weather to fruitfulness in the plum**, M. J. DORSEY (*Jour. Agr. Research [U. S.], 17 (1919), No. 3, pp. 103–126, pls. 3, fig. 1*).—A contribution from the Minnesota Experiment Station, giving the results of the author's investigations, together with a review of the literature on related work. The author considers the effect of various weather factors, such as wind, temperature, sunshine, and rain, on the pollination process and fruit setting.

Summarizing the results of the investigations as a whole, it is concluded that unfavorable weather at blooming time may completely prevent the setting of fruit in the plum, even though there be a full bloom. Rain and low temperatures are the most harmful factors, although prolonged strong winds are also important. The greatest damage from wind is due to interference with insect action and, hence, pollination at critical times. Wind pollination is insufficient even under the most favorable conditions. Frosts occur only occasionally during bloom and injure the pistil more than pollen. The greatest damage from low temperatures is in the retarding of pollen-tube growth. Other conditions being favorable, cloudiness does not prevent the setting of fruit. Rain prevents pollen dissemination by closing the anthers or by preventing them from opening. It does not burst pollen nor kill it. On account of the adhesive action between stigma and pollen, rain does not completely wash pollen from stigmas.

The stigma is receptive for 4 to 6 days, and following the active period of secretion the stigmatic cells rapidly disintegrate. The style abscisses in 8 to 12 days after bloom. As a result of the rapid disintegration in the stigma and the abscission of the style, a delay in pollination or slow tube growth when the temperature is low renders fertilization uncertain. Tube growth appears to be relatively slow in the plum even under favorable conditions.

Analysis of the prevailing weather at bloom shows that the weather factor responsible for the status of the setting of fruit may vary from season to season. Both early and late blooming varieties have been affected by unfavorable weather. Practical remedies under orchard conditions do not appear readily available, but since tube growth seems to be the process most directly affected by low temperatures it is suggested that remedial measures should be sought in suitable pollinizers which show the fastest tube growth.

**Tests with unfruitful plum trees**, G. ESAM (*Jour. Agr. [New Zeal.], 18 (1919), No. 3, pp. 162–164, fig. 1*).—A series of pruning and girdling experiments was started under the direction of the New Zealand Department of Agriculture to determine the cause for the failure of plum trees to set fruit on some of the heavier land in the Hawke's Bay district. The results to date point to cross-pollination as an important factor in securing a good crop of plums. The experiments are to be continued.

**Experiments with varieties of gooseberries, currants, and black currants**, N. ESBJERG (*Tidsskr. Planteavl, 26 (1919), No. 1, pp. 52–79*).—The results for the period 1911–1917 are given of a variety experiment started in 1909 at the experiment station at Spangsbjerg, near Esbjerg, Denmark.

**A commercially new blueberry**, G. E. MURRELL (*Jour. Heredity, 10 (1919), No. 6, pp. 271–275, figs. 3*).—The author describes a small blueberry plantation in northwestern Florida that was established from wild native plants, pos-

sibly *Vaccinium virgatum*, although showing certain differences from that species.

Plantings aggregating 8.5 acres have been made during the past 20 years, and have been commercially successful. There is no apparent difference in productiveness between 20-year-old and 12-year-old bushes, although there is a marked variation in yield between individual plants. From the age of 8 years onward, they average 0.5 bu. of fruit per plant annually, or 3,200 qt. per acre. It has been found that in transplanting suckers from the swamps to the home garden, they should be set somewhat more deeply than they originally grew.

**Manual of American grape growing**, U. P. HEDRICK (*New York: The Macmillan Co., 1919, pp. XIII+458, pls. 32, figs. 54*).—A practical manual for both commercial and amateur grape growers, prepared with the view of covering the whole field of grape growing in America. The successive chapters discuss the domestication of the grape, grape regions and their determinants, propagation, stocks and resistant vines, the vineyard and its management, fertilizers for grapes, pruning the grape in eastern America, training the grape in eastern America, grape pruning on the Pacific coast, European grapes in eastern America, grapes under glass, grape pests and their control, marketing grapes, grape products, grape breeding, miscellanies, grape botany, and varieties of grapes.

**The future of the hybrid direct bearers**, E. PÉE-LABY (*Rev. Vit., 50 (1919), No. 1283, pp. 65–67*).—The author briefly notes some of the more important phases brought out by an investigation, relative to the value of hybrid direct bearers, conducted by the agricultural society of Haute-Garonne. He concludes that, as a result of the knowledge acquired in the demonstration fields established in the various regions of France, the culture of hybrid direct-bearing grapes is believed to offer to viticulture in general actual guaranties of security for the future.

**Observations on the medlar tree flower and the origin of the stoneless medlar in Italy**, I. PIERPAOLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 27 (1918), I, No. 3, pp. 121–125; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 10 (1919), No. 1, pp. 48, 49*).—Observations made on specimens of the medlar tree (*Mespilus germanica*), grown in the garden of the Botanical Institute of the University of Rome, revealed all stages of transition between the normal medlar and the stoneless medlar. The stoneless medlar seems to have originated through the successive reduction of the pistils up to their complete disappearance and through the asexual reproduction of the germs which showed this character for the first time.

The total absence of the pistils is accompanied by the total absence of such secondary characters as the downy areas on the surface of the expansion of the receptacle and the yellow halo of the stamens on the edge of the receptacle.

**Olive culture in Argentina**, C. VALLEJO (*Bol. Min. Agr. [Argentina], 23 (1918), No. 1, pp. 124–147, pl. 1, figs. 17*).—This paper discusses methods of growing olives and the preparation of olive oil, with special reference to the development of the industry in Argentina.

**Avocados, particularly Guatemalans**, W. POPENOE (*Fla. Grower, 19 (1919), Nos. 23, pp. 6, 18–20, figs. 2; 24, pp. 6, 7, 12, 13, figs. 2*).—A paper on this subject, based on the author's study of the avocado in Guatemala (E. S. R., 41, p. 45), in which the author gives special consideration to factors influencing the successful introduction and culture of Guatemalan varieties in Florida.

**[Stocks for citrus trees]**, R. A. DAVIS (*Union So. Africa, Dept. Agr. Rpt., 1917–18, pp. 73, 74*).—A summary of results secured in a test of various stocks for citrus trees conducted under the direction of the Department of Agriculture of the Union of South Africa for a number of years.

More success has been obtained with the rough lemon and the sweet orange than with any other kind of stock. The lemon has been proved suitable for practically all of the many varieties of oranges which have been worked on it. A tendency to the production of a slightly elongated shape of orange has been observed as distinct fronf the rounder form presented by the same variety of fruit when budded on sweet orange. The flavor of the fruit on the older trees budded on lemon stock is equally as good as that grown on sweet orange stock, but with younger trees there is a slight indication of lemon flavor in the oranges. The skin of the Washington Navel fruit from young trees growing on rough lemon stock is rougher than with fruit grown on any other stock. At 10 years old no outward difference can be observed, but the skin is, as a rule, slightly thicker than when sweet or trifoliate roots have been used. The use of rough lemon stock does not appear to influence the color, size, weight, or juice content of the fruit. No instance of root-rot has been met with either on rough lemon or any other stock.

All the different varieties worked on sweet lime root have suffered badly from chlorosis. In addition, this stock has almost as much of a dwarfing effect as trifoliate. Bitter Seville and Florida sour oranges are classed as useless for nursery purposes under soil conditions existing at the experiment stations. No success has been nfet with in the use of the shaddock and pomelo as budding stock. Trifoliata roots have a marked dwarfing effect upon practically all sweet oranges excepting Valencia Late and De Roi, and are not recommended for general use.

**Fertilization of citrus groves during period of high-priced fertilizers,** J. A. PRIZER (*Cal. Citrogr., 4 (1919), No. 9, pp. 231, 255, fig. 1*).—A contribution from the California Citrus substation, in which the author presents a fertilizing program for citrus growers, with special reference to the conservative use of high-priced commercial fertilizers.

**Past and new practices in growing coconuts,** P. C. VAN DER WOLK (*Cultura, 31 (1919), No. 369, pp. 153–182*).—A paper on this subject read before the Tropical Agricultural Society at Wageningen, in which the author points out the importance of the coconut industry to the Netherlands Indies, discusses native methods of growing coconuts, and suggests new cultural practices based on his investigations of the coconut palm previously noted (E. S. R., 39, p. 244).

**Contribution to the study of tea in Indo-China,** P. EBERHARDT and AUFRAY (*Bul. Écon. Indochine, n. ser., 21 (1918), No. 133, pp. 999–1023, pls. 13*).—A review of the present status of tea culture in Indo-China, including analyses of various samples of tea from Laos, Tonkin, and Annam.

**Abnormal growth of scion in relation to stock in some cultivated almonds,** N. PASSERINI (*Bul. Soc. Bot. Ital., No. 1 (1919), pp. 6, 7, fig. 1*).—An illustrated description with circumference data is given of almond trees growing on the grounds of the Agricultural Institute of Scandicci, Florence, Italy. In these the scions have not only greatly overgrown the stocks but have tended to increase the circumference of the stocks in the region of the graft over that at the base of the trees. The normal fruiting of the trees, which are about 25 years of age, has not been interfered with by the abnormal development of the graft.

**The butternut and the Japan walnut,** W. G. BIXBY (*Amer. Nut. Jour., 10 (1919), No. 6, pp. 76–79, 82, 83, figs. 11*).—As a result of requests sent out for superior butternuts the author received specimens from various parts of the country, many of which were rough-shelled Japan walnuts so near like butternuts as to be readily mistaken for them, and some of which were sent in as butternuts. An examination of the evidence now at hand leads to the conclu-

sion that all instances of rough-shelled Japan walnuts have been found in butternut territory. He concludes that the only reasonable explanation of this remarkable change of the Japan walnut from smooth to rough-shell in this country is that it hybridizes with the native butternut.

**Smith's chrysanthemum manual**, E. D. SMITH (*Adrian, Mich.: Elmer D. Smith & Co., 1919, 4. ed., pp. 75, pl. 1, figs. 40*).—In the present edition of this manual (E. S. R., 28, p. 543), many of the chapters have been revised and enlarged, giving more complete details.

**Progress in breeding freesias**, W. VAN FLEET (*Jour. Internat. Gard. Club, 3 (1919), No. 2, pp. 232–239, pl. 1*).—A popular review of progress made in breeding improved varieties of freesias, both in this country and abroad.

**Spring-flowering stocks tried at Wisley, 1916–17** (*Jour. Roy. Hort. Soc., 44 (1919), pp. 117–122*).—Descriptions and notes are given on different varieties of stocks tested at Wisley in 1916–17.

**Color in my garden**, L. B. WILDER (*Garden City, N. Y.: Doubleday, Page & Co., 1918, pp. XV+410, pls. 24, figs. 3*).—In a previous book (E. S. R., 36, p. 142) the author gave her experience in planning and making an ornamental garden. The present book, which is based on color effects developed in this garden, presents suggestions relative to the selection and arrangement of plants with special reference to harmony in color and the development of a series of color pictures throughout the season. The text is accompanied by numerous garden pictures illustrated in color by A. Winegar.

**Report of the botanist**, J. DUNBAR (*Proc. Soc. Amer. Florists, 32 (1916), pp. 164–173; 33 (1917), pp. 197–204*).—The first of these is a report to the Society of American Florists and Ornamental Horticulturists on new trees and shrubs introduced from Western China to North America during the past 18 years. Some 18 genera and 117 species, varieties and hybrids, all of which have come under the author's personal care in the parks at Rochester, N. Y., are considered. The second report deals with important hardy trees and shrubs new or rare in cultivation.

**Winter injury to ornamental trees and shrubs**, F. S. BUCK (*Ann. Rpt. Pomol. and Fruit Growing Soc., Quebec, 1918, pp. 47–53*).—An account with discussion following of the nature and extent of winter injury to trees and shrubs in Canada during the severe winter of 1917–18, including lists of trees and shrubs grouped according to the amount of injury which they sustained.

## FORESTRY.

**Lumber export and our forests**, H. S. GRAVES (*U. S. Dept. Agr., Off. Sec. Circ. 140 (1919), pp. 15*).—A discussion of the foreign demand for American timber and other forest products, the available supply in this country, the probable effect of an increased export trade on this supply, measures that are being taken in foreign countries to preserve and increase forest products, and the great necessity of similar measures in this country.

The author considers the situation to be serious to our wood-using industries and to all consumers of forest products. He advocates appropriate legal and administrative measures to insure adequate forest protection and the use of such methods of cutting as will make possible forest replacement by natural reproduction, together with a broad policy of public acquisition of forests, National, State, and municipal.

It is believed that the adoption of such measures will render safe and wise the encouragement in a large way of the export of lumber and other forest products.

**Firewoods: Their production and fuel values**, A. D. Webster (*London: T. Fisher Unwin, Ltd., 1919, pp. 95, pls. 8, figs. 3*).—This work deals particularly with the firewood problem in Great Britain. The successive chapters discuss sources from which firewood may be obtained; preparing the firewood; comparative value of different firewoods, percentage of water, etc.; heating properties of firewood—scented wood, etc.; firewood value of various home-grown woods; firewood and faggots—storing, capacity, and price; charcoal wood, charcoal burning, comparative value of wood for charcoal, returns from charcoal; charcoal wood for gunpowder; and wood fires and grates. Tabular data on the weight of firewood, cord measurements, and prices, together with the State fuel wood order, issued by the London Board of Trade in 1918, are included.

**Germination trials with Hevea seed**, J. G. J. A. Maas (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 9, pp. 666–725*).—Experiments were started to determine the cause of speedy loss of germinative power in consignments of Hevea rubber seed and the best method of preserving and shipping the seed to obviate rapid deterioration.

The results thus far secured indicate that all measures adopted in the preserving and dispatch of seed should be directed toward preventing the seed from drying up, as they dry quickly and thus lose a large proportion of their germinative power. The fermentation of seed packed in closed cases is also a source of injury.

Instructions are given for preparing and handling the seed in transit, in storage, and in the nursery.

**Wound curing and healing with Hevea trees**, P. E. Keuchenius (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 9, pp. 639–665, figs. 15*).—Wounds in cases where the bark was totally pared off recovered more quickly than where the bark was not wounded down to the cambium (ordinary tapping cuts). Totally pared bark, however, retards retapping operations as compared with partly wounded bark, because in partly wounded bark there always remain a certain number of lactiferous layers intact which may be tapped sooner, even though the renewed bark is thinner than the renewed bark of a totally pared off wound. These results indicate that in cases of canker infection paring should only be sufficiently deep to remove all traces of the infection. See also a previous note (E. S. R., 40, p. 448).

The time after which renewed bark, either on a superficial wound or on a wood wound, becomes tapable again can not be given in general terms, because trees differ in the number of latex rings formed in a given time. Experiments in the chemical treatment of wounds showed that recovery was accelerated by 43.5 days by treating the wounds with a solution of 0.25 gm. of calcium chlorid and 0.25 gm. magnesium chlorid in 100 cc. of water. Treatment with distilled water also gave good results. Directions are given for treating and bandaging wounds.

**Progress report of forest administration in Baluchistan for 1917–18**, Muhammed Afzal (*Rpt. Forest Admin, Baluchistan, 1917–18, pp. [6]+20*).—The usual report on the administration of the State forests in Baluchistan for the year ended June 30, 1918. Data relative to alterations in forest areas, yields in major and minor forest products, miscellaneous work, revenues, expenditures, etc., are appended in tabular form.

**Annual report on the forest administration in Ajmer-Merwara for the year 1917–18**, Shambhoo Datt Joshi (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1917–18, pp. 26*).—A report similar to the above on the administration of the State forests in Ajmer-Merwara.

## DISEASES OF PLANTS.

**Plant pathology to-day**, C. L. SHEAR and N. E. STEVENS (*Sci. Mo.*, 7 (*1918*), *No. 3, pp. 235–243*).—This is a brief account, with illustrations, of the progress of plant pathology as regards aims, methods, accomplishments, limitations, restrictions, present tendencies, and opportunities for this work, and more particularly of the broader outlook of pathologists and of the general tendency toward effective cooperation, both within and between States and Nations.

**Progress in control of plant diseases**, R. E. VAUGHAN (*Ann. Rpt. Wis. State Hort. Soc., 48 (1918), pp. 179–186*).—It is stated that by employment of sanitary measures, coupled with spraying, a number of diseases can be controlled, though chief reliance is placed on the development of resistant plants. The fungus causing cherry leaf spot was found (as is the case also with apple scab) to overwinter on falling leaves. Angular leaf spot and anthracnose of cucumber are controlled by seed treatment. Cucumber mosaic appears to be associated with the presence of the striped cucumber beetle. Strains of kraut cabbage resistant to yellows have been developed. Tobacco strains resistant to root rot have also been obtained. Bordeaux mixture at a strength of 3:3:50 gives control of cherry shot-hole leaf spot with only two applications if these are timely and are combined with sanitary measures.

**[Plant diseases in South Africa, 1917–18]**, I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt., 1917–18, pp. 65–68*).—In this portion of the report on the division of botany, the author gives brief notes on investigations carried out on citrus canker, bacterial spot of citrus (*Bacillus citrimaculans*), walnut blight (*Bacterium juglandis*), bean blight (*B. phascoli, Pseudomonas* sp.), sugar cane root disease (*Marasmius* sp.), cane leaf spot (*Cercospora sacchari* or *Helminthosporium* sp.), papaw leaf spot (*Phoma* sp.) and fruit spit, and pineapple black rot (*Penicillum* sp.), together with a list of papers issued during this period on plant diseases.

It is stated that a further outbreak of citrus canker was discovered at Wolhuterskop near Rustenburg in June, 1917. Apparently the disease had been present in one locality for 8 or 9 years, being traceable to nursery-stock, buds, or cuttings.

**[Outgrowths on plants]**, T. A. C. SCHOEVERS (*Tijdschr. Plantenziekten, 24 (1918), Nos. 3, pp. 123–132; 4, pp. 133–148*).—This is mainly a discussion of known data on crown gall, with references to contributions on the subject.

**[Verticilliose] in cultivated crops**, H. A. A. VAN DER LEK (*Tijdschr. Plantenziekten, 24 (1918), No. 3, pp. 81, 82*).—A brief account is given of a study during 1916–17 of verticilliose in cucumber, said to be identical with the disease caused by *Verticillium alboatrum* in potato and other plants.

**Clover stem rot**, F. A. WOLF and R. O. CROMWELL (*North Carolina Sta. Tech. Bul. 16 (1919), pp. 5–18, pls. 3*).—The presence in North Carolina of a stem rot disease of crimson clover has led to a study of this disease, which is said to be prevalent in Europe and rather widely distributed in the United States. The disease is due to *Sclerotinia trifoliorum* and, in addition to the crimson clover, the fungus attacks red clover, white clover, alsike clover, and alfalfa. The disease prevails from October to March and may be recognized by the sudden wilting and death of plants in spots, a rotting off or decay of the stem near the ground, and the presence of black sclerotia on the decaying stems.

A study was made of the development of *S. trifoliorum* in comparison with *S. libertiana*, and infection experiments were made with the different organisms. Comparative morphological studies indicate that they are distinct species. The sclerotia are said to remain dormant in infested soils, and to be carried by contaminated seed as well as on implements, soil, hay, etc. It is recommended that

care be exercised in the transfer of soil in the inoculation of new fields with the nitrogen-fixing organism, and in not returning manure to clover fields when hay from infested fields has been fed. The adoption of a system of crop rotation is said to be the only reliable means of control for infested fields.

**"Heart damage" in baled jute**, R. S. FINLOW (*Mem. Dept. Agr. India, Chem. Ser., 5 (1918), No. 2, pp. 33–68*).—Reporting results of studies carried on since 1907, the author states that heart damage of jute occurs only where damp jute is closely packed in mass. In the center a rise of temperature occurs, due to the action of thermophilic bacteria which attack the cellulose constituent of the fiber, which is apparently hydrolyzed and rendered useless for spinning purposes. Isolated bacterial cultures reproduced the heart damage in the laboratory. *Aspergillus fumigatus*, although almost always present, is supposed simply to live on the degradation products of the cellulose.

Tight packing lowers the water requirement conditioning heart damage, which never occurs in so-called genuine jute, this term being applied to jute which has been perfectly dried and which has not been exposed to night dews or otherwise watered. Ship damage is supposed to be identical with heart damage, although it originates on the outside of the bales.

**Heart rot or black pit of pea**, H. A. A. VAN DER LEK (*Tijdschr. Plantenziekten, 24 (1918), No. 3, pp. 102–114, pl. 1*).—This trouble, which appears to have been present in Holland for some years, has been associated with bacteria and also with *Ascochyta pisi*, but further studies regarding the causal organism are considered necessary.

**Potato diseases, VI–VIII**, E. M. DOIDGE (*So. African Fruit Grower, 5 (1918), Nos. 1, pp. 6, 7, figs. 2; 3, pp. 47, 48, figs. 6; 5, pp. 94, 95, figs. 2*).—Three papers are given.

VI. *The Rhizoctonia disease of potatoes* (*Corticium vagum solani*).—*C. vagum solani* is discussed, as occurring in its sclerotial stage *R. solani* on potato, in connection with rosette, little potato, aerial potato, stem rot, and russet scab, with conditions favoring the disease (heavy soil, poor drainage, and high temperature) and its control (including the use of corrosive sublimate, 2.5 oz. to 15 gal. water, treatment for seed tubers, clean cultivation, and rotation).

VII. *Late blight or Irish potato blight* (*Phytophthora infestans*).—It is stated that although late blight (*P. infestans*) is ordinarily of secondary importance in South Africa as compared with early blight (*Macrosporium solani*), it occasionally appears during very wet seasons in epidemic form, being favored by the presence of other hosts, but is controllable by the proper use of Bordeaux mixture in due season.

VIII. *Internal brown fleck*.—This disease is supposed to occur wherever potatoes are cultivated and to be quite common in South Africa, appearing to be connected with deficiency of lime, sulphates, and perhaps nitrogen.

**Leptonecrosis [leaf roll] of the potato plant, and allied diseases**, H. M. QUANJER, H. A. A. VAN DER LEK, and J. A. BOTJES (*Ann. Sci. Agron., 4. ser., 6 (1917), Nos. 7–9, pp. 301–357, figs. 11; 10–12, pp. 455–494, figs. 2*).—This is a translation into French by V. Antoine of a contribution previously noted (E. S. R., 36, p. 847). It includes an extended bibliography.

**The use of lime in controlling finger-and-toe in turnips**, J. HENDRICK (*Trans. Highland and Agr. Soc. Scot., 5. ser., 30 (1918), pp. 137–145*).—Having noted in a previous report (E. S. R., 31, p. 424) a reduction of finger-and-toe in turnips associated with the use of lime either in burnt form or as carbonate, the author now gives attention to some criticisms offered regarding the use of lime, presenting illustrations of successful applications of such treatments during the years 1915 to 1917 employing ground lime or waste lime from paper works.

The conclusion drawn by the author is that finger-and-toe in turnips can be kept in check or entirely prevented by using lime in sufficient quantity to neutralize all sourness and leave some excess of carbonate of lime in the soil. It is not necessary to lengthen the rotation in order to prevent the disease, since turnips can be grown in short rotation year after year on the same soil provided the soil is kept sufficiently supplied with lime.

**"Little leaf" of deciduous fruits**, R. W. HODGSON (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 9, pp. 529–532, figs. 3*).—In a progress report of studies on little leaf, it is stated that in the exceptionally dry season of 1917 little leaf was unusually prevalent, particularly in dry-farmed sections where the water supply is early exhausted. A decided relation of the occurrence of the trouble to light sandy soils was also observed. Most regions of California have, of the conditions related to winter dormancy elsewhere, only that of soil moisture deficiency. Severity of desiccation may be expressed by the development of little leaf, which is frequently present in only a portion of a tree, possibly a part which is deficient as regards water supply and which is backward as regards maturity.

On the other hand, a different type of injury is associated with overirrigation, apparently due to exhaustion of the food reserve due to the abnormal continuation of growth late in the season.

A tree may suffer from the lack of moisture, it is thought, even when the water table has been raised by irrigation to within a foot of the surface, since only the capillary water above the water table can be utilized. This may account for the presence of little leaf where the water is near the surface. The rise of the water may actually deprive the roots of their capillary water supply under the conditions thought to exist in this region.

**A new disinfectant for pear blight**, F. C. REIMER (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 10, pp. 562–565*).—In experiments which were started in June, 1918, to test the effectiveness of disinfectants for pear blight on wounded trees, it was found that under specially favorable conditions as regards concentrations, etc., the application of Bordeaux paste, corrosive sublimate, cresol, lime-sulphur, blackleaf 40, and chlorazene failed to prevent severe infection by pear blight brushed on wounded surfaces. Cyanid of mercury was completely preventive at 1:500, while at 1:1,000 occasional development of pear blight occurred and at 1:300 severe injury was caused. It is thought, therefore, that a strength of 1:500 is both safe and effectiye for application to tree wounds. Corrosive sublimate is considered effective for use with the tools employed for cutting out diseased wood, the only curative treatment yet found to be effective against pear blight.

**Citrus canker [in the Transvaal]**, I. B. P. EVANS (*So. African Fruit Grower, 5 (1918), No. 3, pp. 44, 49*).—A résumé is given with remarks made at the Transvaal Agricultural Union Meeting, September, 1918, on citrus canker in regard to its appearanse at different points in the Cape and Transvaal Provinces. The disease is said to have spread to an extraordinary extent in the citrus orchards on account of the exceptionally wet season of 1917. Vigorous action resulted in complete suppression of the disease in several districts, so that it is hoped that it may soon be completely eradicated in these regions.

**Bud curl of the lemon tree**, C. C. MILLER (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 9, pp. 515–519, figs. 5*).—Explanation is given of the author's conception regarding the production of bud curl or pinch at the grafting union in case of lemon trees (especially when grafted on orange stock), and of the means to be employed to remove or rather to avoid such obstruction to the flow of elaborated sap toward the roots. The plan discussed involves slitting the

bark in such a way that the wounds will unite by continued inrolling above and below the graft union, and bridging the pinched region with a live layer of bark and cambium, thus eliminating the pinched belt which previously blocked the path of the elaborated sap.

**On a tree of Æsculus pavia killed by Botrytis cinerea**, W. B. BRIERLEY (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 9–10 (1917), pp. 315–331, pl. 1, figs. 2*).—An account is given, with discussion, of the killing of a specimen of *Æ. pavia* supposedly within 15 days after invasion by a fungus, apparently *B. cinerea*. The tree was killed above the belt of attack, apparently by checking very quickly the upward flow of water in the trunk. The tissues below the limit of fungal extension remained alive, exuberantly healthy, while those above soon became dry and shriveled. To determine the nature of the hypothetical occlusion of the water-conducting tissues, a thorough comparative examination of the diseased tissues was carried out, revealing the presence of approximately ten times as many tyloses in the diseased area as in the corresponding area of healthy wood and suggesting that the stoppage of the upward flow may have been due to their sudden accumulation.

Discussion is given also of the formation of conidiophorous stromata and of true sclerotia and of the constant relation of these to the lenticels.

It is stated that features presented by the morphology of the fungus in the tissues are to be described in a later publication.

**Walnut blight [in South Africa]**, E. M. DOIDGE (*So. African Fruit Grower, 5 (1918), No. 4, pp. 68, 69, figs. 2*).—Walnut blight appearing recently in portions of South Africa is said to have been shown by investigations to be due to *Bacterium juglandis*, which is identical with the organism causing a similar disease in America and New Zealand. The blight appears to have been introduced with nursery stock, and to be greatly favored by the prevalence of rain and mist in spring and early summer during the growth of the nuts, many or most of which may drop at an early stage of development. The disease is carried over in leaves and in the lesions on the twigs.

**Note on Polysaccum crassipes: A common fungus in eucalyptus plantations around Pretoria**, P. A. VAN DER BIJL (*Trans. Roy. Soc. So. Africa, 6 (1917), pt. 3, pp. 209–213, pls. 6*).—The author gives a brief note on *P. crassipes*, which is a very common fungus in eucalyptus plantations around Pretoria. It is suggested that the relation between fungus and host is that of symbiosis, as the tissues of the plant do not appear to suffer from the presence of the fungus. Reference is made to the earlier and more general works on symbiosis.

**Heart rot of Ptæroxylon utile caused by Fomes rimosus**, P. A. VAN DER BIJL (*Trans. Roy. Soc. So. Africa, 6 (1917), pt. 3, pp. 215–225, pls. 6*).—The author gives an account of heart-rot disease in *P. utile*, ascribed to *F. rimosus*, as regards distribution of the fungus and its effect on the wood. This fungus is stated to have been reported in the Union of South Africa on 11 genera belonging to 8 different natural orders.

**Decayed wood and the fungi therein as seen with the microscope**, H. N. LEE (*Trans. Nat. Assoc. Cotton Manfrs., No. 102 (1917), pp. 220–226, figs. 6*).—This is a preliminary description of the effect of important wood destroying fungi on structural timbers taken from cotton mills and of the appearance of the fungi in the wood, with an outline of projected study to identify the fungi in the absence of fruiting bodies.

**The decay of timbers in buildings**, R. J. BLAIR (*Trans. Nat. Assoc. Cotton Manfrs., No. 102 (1917), pp. 242–250, figs. 6*).—The question of decaying wood being considered as mainly, if not purely, a matter of moisture (relative humidity), an account is given illustrating the operation of this factor; also of

special devices which are described for the projected study of the critical humidities for the growth of fungi. The first test is to be made with *Lenzites sepiaria* on hemlock.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**A review of the ornithology of Minnesota,** T. S. ROBERTS (*Univ. Minn. Current Prob. No. 11 (1919), pp. VI+101, figs. 49*).—This contains a synopsis of the bird life of Minnesota, a check-list of birds known to occur regularly in Minnesota, lists of birds that are rare or accidental in Minnesota, introduced species, unsettled species, extirpated species, and vanishing birds, a hypothetical list, a synopsis of Minnesota bird laws and of the Federal migratory bird law and the migratory bird treaty act, wild life refugees in Minnesota, a list of Minnesota game and wild life refugees, and outlawed and questionable birds. An abridged bibliography of Minnesota ornithology, together with an index thereto by authors' names and dates and a subject index are also included.

**Some recent investigations on the food of certain wild birds,** W. E. COLLINGE (*Jour. Bd. Agr. [London], 25 (1918), No. 6, pp. 668–691, figs. 17*).—From an examination of the stomach contents and of the crop where present of 3,670 adult birds and 595 nestlings, embracing 9 species of wild birds, the author concludes that the volumetric method or percentage by bulk is the only reliable one for estimating the nature of the food and a bird's true economic position, and that the numerical method is highly misleading and unsatisfactory. Two of the 9 species of wild birds treated, namely, the house sparrow and wood pigeon, are distinctly injurious; 2, the rook and sparrow hawk, are too numerous and consequently injurious; 1. the missel thrush, is locally too numerous; and 4, the skylark, the green woodpecker, the kestrel, and the lapwing, are highly beneficial. In the interest of agriculture it is very desirable that strong repressive measures be taken against the house sparrow and wood pigeon and for the time being that all protection be withheld from the rook, sparrow hawk, and the missel thrush, while every protection should be given to the 4 species that are highly beneficial.

It is further concluded as a result of this investigation that all of the commoner species of wild birds require reinvestigating so far as their food and feeding habits are concerned, and that their various food items should be worked out and estimated by the volumetric method.

A list of 23 references to the literature is appended.

**Some further investigations on the food of wild birds,** W. E. COLLINGE (*Jour. Bd. Agr. [London], 25 (1919), No. 12, pp. 1444–1462, figs. 9*).—In this article, which is in continuation of that above noted, the author reports upon examinations made of the stomach contents of 798 adults and 166 nestlings, embracing 8 species of wild birds.

It was found that "the jackdaw, yellow bunting, great tit, blue tit, song thrush, and fieldfare are distinctly beneficial. The great tit, blue tit, and fieldfare are beneficial to such an extent that their protection is advisable. In spite of the injuries it commits, it would be unwise to recommend any repressive measures for the chaffinch. The starling has been allowed unduly to increase. At the present time it is far too numerous, and the injuries it commits are far greater than the benefits it confers. Temporary repressive measures would, no doubt, help to restore a more normal population of this bird, with considerable benefit to both the farmer and the fruit grower."

A list is given of 9 references to the literature.

North American pseudophyllidean cestodes from fishes, A. R. Cooper (*Ill. Biol. Monographs, 4 (1918), No. 4, pp. 243, pls. 13*).—This report of studies includes a bibliography of 10 pages.

Work connected with insect and fungus pests and their control, F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1917–18, pp. 12–14*).—This report relates entirely to the cotton stainer (*Dysdercus delauneyi*) and the measures taken in its control.

[Insects and insect control in British Guiana], G. E. Bodkin (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1917, pp. 53–66*).—A discussion of the occurrence of and work with the more important insects of the year, in which particular attention is given to the locust invasion and their combat.

Common British beetles and spiders and how to identify them, S. N. Sedgwick (*London: Charles H. Kelly [1919], pp. 62, figs. 285*).—A small pocket handbook.

Notes and observations on agricultural entomology, G. del Guercio (*Agr. Colon. [Italy], 12 (1918), Nos. 4, pp. 216–230, figs. 5; 5, pp. 273–323, figs. 41; 13 (1919), No. 1, pp. 31–62, figs. 31*).—Papers are presented on a New Enemy of the Beet (*Gelechia ocellatella*) (pp. 216–230) (see p. 460); A Thysanopterous Enemy of the Vine in Bengasi (*Dictyothrips ægyptiaca*) (pp. 273–286); The Carob Cecidomyid (*Eumarchalia gennadiosi*) (pp. 287–297); The Pink Bollworm and Its Endophagous Enemies (pp. 298–311); The Dipterous Enemy *Rondaniella phorodontis* n. sp. of the Hop Aphis (pp. 31, 32); The Dipterous Enemy *R. macrosiphonis* n. sp. of the Artichoke Macrosiphon (pp. 33–35); etc.

[Report of] division of entomology, C. P. Lounsbury (*Union So. Africa Dept. Agr. Rpt. 1917–18, pp. 87–107*).—A detailed account of the work of the year ended March 31, 1918, in which particuar attention is given to the work with locusts.

Annual report of the government entomologist, C. C. Gowdey (*Ann. Rpt. Dept. Agr. Uganda, 1918, pp. 42–51*).—Brief notes are given of the insect pests of the year under the headings of pests of coffee, cacao, Para rubber, etc. A large part of the report deals with studies made of the variegated bug (*Antestia orbitalis faceta*), which attacks both *Coffea arabica* and *C. robusta*.

[Report on] entomology (*Rpt. Prog. Agr. India, 1917–18, pp. 85–101*).—The occurrence of and work of the year with the more important insect pests is reported upon.

Insect pests of low-country products, G. M. Henry (*Ceylon Agr. Soc. Year Book, 1919–20, pp. 107–113*).—Brief accounts are given of the pests of coconut, grain crops, bandakka, legumes, cucurbits, sweet potatoes, and mustard and means for their control. A list of the common pests of food crops is included.

Florida truck and garden insects, J. R. Watson (*Florida Sta. Bul. 151 (1919), pp. 113–211, figs. 57*).—A revision of Bulletin 134, previously noted (E. S. R., 37, p. 356).

Cotton pests in Montserrat (*Agr. News [Barbados], 18 (1919), No. 447, p. 182*).—This discussion relates particularly to the cotton stainer and a slug (*Veronicella occidentalis*).

Insect pests of tea, E. A. Andrews (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 1 (1919), pp. 22–25*).—A brief discussion of the more important species.

The occurrence of forest insects in Sweden in 1917, I. Trägårdh (*Meddel. Stat. Skogsförsökanst., No. 16 (1919), pt. 4, pp. 67–114, figs. 14*).—The species of which particular mention is made are *Scolytus ratzeburgi, Ips acuminatus, Myelophilus piniperda, M. minor, I. typographus, Bupalus piniarius*, and *Cephaleia signata*.

Preliminary memorandum on current views as to the damage done to stored grain and flour by insects and mites, and the best means of prevention (*Roy. Soc. [London], War Committee Memo. 1 (1918), pp. 2*).—A brief reference to the literature.

Some necessary steps in any attempt to prove insect transmission or causation of disease, W. D. PIERCE (*Science, n. ser., 50 (1919), No. 1284, pp. 125–130*).—An outline of the steps necessary for successful investigation.

Clean cultivation in its relation to the control of insect pests, H. H. KING ([*Wellcome Trop. Research Lab.*] *Ent. Bul. 8 (1918), pp. 4*).—A brief discussion.

A comparison of the toxic action of volatile substances on insects, G. BERTRAND and MRS. M. ROSENBLATT (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 18, pp. 911–913*).—Of the eight substances tested by the authors on the caterpillar of *Bombyx neustria* chloropicrin was found to be most toxic, being slightly more so than hydrocyanic acid gas.

The Pentatomoidea of Illinois, with keys to the Nearctic genera, C. A. HART (*Ill. Dept. Registr. and Ed., Div. Nat. Hist. Survey Bul., 13 (1919), Art. 7, pp. 157–223, pls. 6*).—This work, edited by J. R. Malloch, the manuscript having been only partly completed at the time of the author's death, includes descriptions of nine species and a genus (Cydnoides) new to science.

The fungus parasite of the periodical cicada, A. T. SPEARE (*Science, n. ser., 50 (1919), No. 1283, pp. 116, 117*).—This is a preliminary account of studies of *Massospora cicadina*, a detailed report of which is soon to be issued.

The beet leaf hopper.—A report on investigations into its occurrence in California, H. H. P. SEVERIN (*Facts About Sugar, 8 (1919), Nos. 7, pp. 130, 131, 134, fig. 1; 8, pp. 150, 151, fig. 1; 9, pp. 170, 171, 173, fig. 1; 10, pp. 190, 191, fig. 1; 11, pp. 210, 211; 12, pp. 230, 231, fig. 1; 13, pp. 250, 255, fig. 1*).—This report is accompanied by tables which give the details relating to the occurrence of the beat leaf hopper in California. The data thus presented include the number of beet leaf hoppers captured on plants in the desert and in the cultivated area of the Imperial Valley, on the plains and foothills, and in the cultivated area of the San Joaquin Valley, and under natural conditions and in the cultivated area of Salinas Valley; lists of plants in which the beet leaf hopper deposited eggs in the cultivated area of the San Joaquin, Sacramento, and Salinas Valleys; plants on which the beet leaf hopper was collected and transmitted curly leaf to sugar beets; plants from which the beet leaf hopper was reared and transmitted curly leaf to sugar beets; number of dark male and female beet leaf hoppers captured in cultivated and natural breeding areas; and number of days beet leaf hoppers lived without food during winter.

A review of the leaf hoppers of the genus Gypona north of Mexico, E. H. GIBSON (*Proc. U. S. Nat. Mus., 56 (1919), pp. 87–100*).—Thirty-three species are recognized, of which eight are described as new to science.

Report to the froghopper committee on Mr. Glasgow's supposed cure for froghoppers, C. B. WILLIAMS (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 1, pp. 10–15, figs. 4*).—Demonstrations given failed to prove the liquid sufficiently effective in destroying either the eggs or nymphs of the froghopper or the fungi causing root disease.

A species list of the Aphididæ of the world and their recorded food plants, H. F. WILSON and R. A. VICKERY (*Trans. Wis. Acad. Sci., Arts, and Letters, 19 (1918), pt. 1, pp. 22–355*).—The first part (pp. 26–180) of this list consists of a species list of the Aphididæ of the world with their recorded food plants, and the second part (pp. 181–355) of a list of aphid food plants and the aphids said to attack them.

Fighting the walnut aphis, R. W. Hodgson (*Cal. Cult., 53 (1919), No. 3, p. 53, fig. 1*).—The author describes a new dusting method for controlling the ravages of the walnut aphis as worked out by R. E. Smith, which consists in the use of a dry dusting mixture of 74 per cent kaolin and 24 per cent hydrated lime upon which 2 per cent of nicotin sulphate has been sprayed. This mixture is blown onto the trees by means of a duster, driven by a 3 h. p.-gasoline engine. The average application per tree of from 2 to 3 lbs. of the material gives a kill of 95 per cent. The mixture is prepared at a cost of 5 cts. per pound and from 20 to 40 acres can be dusted per day, depending upon the size of the trees and the way in which the rig is set up.

"The kill is effected largely by the fumes and is very rapid, as within a few minutes after dusting clouds of dead aphis may be seen falling from the trees. The zone of effective killing is comparatively large, as for two or three rows beyond the dusted area the trees will be found to be comparatively free from aphis."

The results of the work in 1919 clearly indicate that it is possible in this way to control the pest effectively. The method has reduced the cost more than one-half, and made it possible to get over the orchard from five to six times as fast as formerly.

It is pointed out that as reinfestation from adjoining infested orchards will take place in a few days the control of the walnut aphis is a community problem. "With the new method it seems possible to cover quickly and effectively a large enough acreage to make one application sufficient. This is apparently what has occurred this past season in Santa Barbara County, it being reported that practically every ochard in the county was dusted."

"The new method also gives promise for successful control of the new codling moth worm for which it is now being used in infested areas, dry powdered lead arsenate being added to the aphis dusting compound."

The Aphididæ of Lahore, Bashambar Das (*Mem. Indian Mus., 6 (1918), No. 4, pls. 18*).—The plates here published illustrate the work previously noted (E. S. R., 40, p. 650).

Host list of fluted or cottony cushion scale, G. B. Merrill (*Quart. Bul. Plant Bd. Fla., 3 (1919), No. 4, pp. 125–133*).—This is a compilation of the hosts of the cottony cushion scale.

A contribution to the knowledge of the Coccidæ of southwestern United States, G. F. Ferris (*Leland Stanford Jr. Univ. Pubs., Univ. Ser., 1919, pp. 68, figs. 38*).—This report is based, for the most part, upon material collected by the author in the course of an extended tour through the arid southwestern portion of the United States during an investigation of the abundance and distribution of a lac-producing scale insect, *Tachardia larreæ*.

Of the 59 species representing 33 genera noted, 13 are described as new to science.

Lice and their menace to man, L. Lloyd (*London: Henry Frowde and Hodder & Stoughton, 1919, pp. XIII+136, figs. 17*).—This book brings together the present status of knowledge of lice for the general reader. Following an introduction the several chapters deal with the subjects as follows: Structure of the body louse, life history and habits, dissemination of the body louse and lousiness, disinfestation, the head louse, the crab louse, increased migration of body lice in fevers, relapsing fever, typhus fever, and trench fever. A subject index is included.

An investigation of the louse problem, W. Moore and A. D. Hirschfelder (*Univ. Minn., Studies Biol. Sci., No. 3 (1919), pp. 86, pl. 1, figs. 7*).—The details of the investigation here reported are briefly summarized by the authors as follows:

"Lice may be reared under incubator conditions in large numbers if fed with human blood twice daily, but under such conditions the life cycle is slowed down and the daily and total egg production per female is reduced. Fever, rash, and a general lassitude are produced as a result of the louse bites.

"Lice and their eggs are destroyed by the ordinary laundering processes used in the washing of cotton and khaki goods; for woolens slight alterations in the methods of washing are necessary. Chlorpicrin may be used for fumigation of garments, accomplishing the desired results in a short period of time with a small quantity of the chemical, without the use of high temperatures. The sachet method of controlling is ineffective or very expensive. Louse powders may be used with success, but being a wasteful method of applying an insecticide are not recommended. Impregnation of the underwear is the most promising method of louse control between lousings. Active chemicals of very low volatility are necessary to prove effective for the longest period of time. Halogenated phenols such as dibrommetacresol, dichlormonobrommetacresol, and their sodium salts, dibromcarvacrol, and dibromxylenol were found to be the most promising under laboratory conditions."

In an appendix the authors describe the preparation of certain compounds used in the experiments. A bibliography of 44 titles is included.

**Contribution to the anatomy, physiology, and biology of the body louse (Pediculus vestimenti)**, Z. H. Sikora (*Arch. Schiffs u. Tropen Hyg. 20, (1916), Beiheft 1, pp. 76, pls. 3, figs. 24*).—This part deals with the anatomy of the alimentary canal.

**Silk and silkworms in the Far East**, Mr. and Mrs. Booth-Tucker (*Agr. Jour. India, 14 (1919), No. 1, pp. 140–155*).—This contains information gathered during a recent visit to China, Japan, Korea, Manchuria, and French Indo-China.

**The peach twig borer (Anarsia lineatella)**, D. E. Merrill (*New Mexico Sta. Bul. 116 (1918), pp. 15, figs. 11*).—This is a report of studies of the peach twig moth commenced in the summer of 1912 with a view to determining the life history and habits of the pest and testing control measures under local conditions. Injury is caused in two ways (1) to the tender shoots in spring when starting to grow and (2) by the summer broods to the fruit by eating into the surface or into the pit, resulting in dropping or decay and rendering such fruit worthless for shipping. It is said that from 5 to 15 per cent of the fruits of later varieties is not an unusual amount of injury, and in years of severe infestation the damage may reach 50 per cent. The species now occurs in the Mesilla and Pecos Valley regions, New Mexico, having been first met with by the author in Mesilla Valley in 1912, in which year it was quite numerous. Since then it has been moderately injurious on an increasing scale until 1918, when the damage again was very severe, 50 per cent of the crop in many orchards being more or less injured.

There appear to be three generations each year in New Mexico, the broods overlapping. The small overwintering larvæ emerge and begin work on the leaf buds about the first few days in April, from which time until about May 1 they may be found damaging the growing shoots. Apparently only very young larvæ hibernate, which it is thought represent parts of two broods. The eggs, which are usually laid singly on the twigs near the peaches or directly upon the fruit, hatch in about 5 days. In midsummer the larvæ mature in from 8 to 13 days, pupation taking place about 24 hours after maturity is reached, at which time the average length is from 10 to 12 mm. From 8 to 12 days are passed in the pupal stage.

Control work showed that spraying with powdered arsenate of lead, 3 lbs. to 100 gal., or lime-sulphur (1:10) weaker than the usual dormant spray just

as the buds become pink, is quite effective. It is pointed out that control work should be practiced by the entire community since reinfestation will otherwise take place during the summer. Summer control methods proved to be of no practical value.

A record by Morrill of the occurrence of the species for the first time in Arizona in 1917, when it was very destructive to peaches in three widely separated orchards in the Salt River Valley, has been noted (E. S. R., 40, p. 853).

**The life history of the oriental peach moth (Laspeyresia molesta),** C. HARUKAWA and N. YAGI (*Ber. Ōhara Inst. Landw. Forsch., 1 (1917), No. 2, pp. 151–170, pls. 2*).—It is pointed out by the authors that there are three closely related enemies of the peach in Japan, namely, the codling moth, *Carpocapsa persicana*, and *L. molesta*. It is believed that *L. molesta* is not a native of Japan, since damage by it was not observed prior to 1899 and it has attracted attention only since 1902. The species is distributed throughout Japan, except in Hokkaido and the northern portions, and also occurs in Korea.

There are five generations on the southern coast of western Japan and four in the Province of Schimane. In field cages the length of the life cycle varied from 26 to 37 days. From 5 to 65 eggs were deposited by each female, the egg stage lasting from 2 to 4 days, the larval from 11 to 15, and the pupal from 6 to 10 days. The caterpillars of the last generation hibernate, the adults emerging about the end of April. The authors have observed its oviposition on *Pyrus sinensis*, pear, *Prunus mume*, Japanese cherry, common cherry, apple, plum, and sand cherry, and reared the pest on all but apple. Much of the data are presented in tabular form.

Studies of this pest in the United States by Quaintance and Wood (E. S. R., 36, p. 358), Wood and Selkregg (E. S. R., 39, p. 259), and by Garman (E. S. R., 39, p. 260) have been noted.

**The rice moth,** F. H. CHITTENDEN (*U. S. Dept. Agr. Bul. 783 (1919), pp. 15, pls. 5, figs. 2*).—Complaints of damage by what proved to be *Corcyra cephalonica* received in October, 1911, from a firm manufacturing chocolate in western Pennsylvania and a year later from another manufacturer in the same State led to the discovery for the first time of the occurrence of this insect in the United States, but it was not identified until 1916. While the origin of the species is unknown, it has been introduced at many points in other continents and has been found commonly in England, where it was introduced in rice, chiefly from India and Burma, and also in dried fruits. While it has only been recognized in this country from western Pennsylvania and Port Rico, it is thought to occur without doubt at other points.

The species is inclined to be omnivorous, breeding in rice, dried fruits, cacao leaves and the various products of cacao, such as cocoa, cacao shells, and sweetened and unsweetened chocolate, shop biscuits, and sesame seeds. No partiality is shown for any of these food substances, however.

While its complete life history has not been ascertained, it reproduces nearly the year around under average indoor conditions. In the United States, infestations appear to die down from time to time, but are stimulated through shipments of cacao beans from South and Central America. It produces copious and dense external webbing to which food materials, such as rice, cocoa, and other matter, strongly adhere. In this respect its work and injury resemble those of the fig moth (*Ephestia cautella*) and related species and the Indian meal moth.

Control measures include the clearing out of infested warehouses, fumigation of sacks which have contained rice or other cereal, cacao beans, etc., and destruction of waste by burning, after which the plant should be fumigated with hydrocyanic acid gas or heat applied (120 to 130° F.) for several hours.

The greenhouse leaf-tyer (Phlyctænia ferrugalis), A. H. GIBSON (*Agr. Gaz. Canada, 6 (1919), No. 7, pp. 626–629, figs. 2*).—This pest, also known as the celery leaf-tyer, is a European insect, long known in the United States, which has increased in recent years to a serious extent in many greenhouses in eastern Canada. It attacks a wide range of greenhouse plants and a number of vegetables.

Eggs kept under observation at Ottawa hatched in 14 days. There are 5 larval instars, all stages having been found developing at the same time and at various seasons, and the generations apparently overlap. The larvæ, which feed almost entirely on the underside of the leaves, eat away the green tissue. In the case of the mature larvæ, conspicuous portions of the leaves are entirely eaten. The length of the pupal stage is from 17 to 20 days. In observations made at Ottawa during the winter months, from 70 to 75 days were required for the completion of its life cycle. It is estimated that under greenhouse conditions there is time from the end of September to the end of May for at least 3 or possibly 4 generations. For control the author recommends the use of soluble sulphur 1 oz., blackleaf 40, 1 fluid ounce, and water 6 gal.

**Tests of lead arsenate.—Effectiveness of different brands in controlling codling moth**, H. B. TERRY and W. F. SCHLUPP (*So. African Fruit Grower, 6 (1919), No. 5, pp. 108, 109, 111, fig. 1*).—This is a progress report in which tables are given showing the results obtained in 1917–18 and 1918–19 with a considerable number of preparations.

**A microlepidopteran injurious to avocado**, A. BUSCK (*Proc. Ent. Soc. Wash., 21 (1919), No. 6, pp. 125, 126*).—This note relates to a species (*Stenoma catenifer*) which feeds in the fruit and seed of the avocado (*Persea* spp.) and appears to be of considerable economic importance because of its destructiveness. The species has been received from Guatemala and Ecuador, and it is said to be almost impossible to buy a single avocado in the market of Ecuador which has not at least one of the worms in the seed.

**Gelechia ocellatella, a new enemy of the beet in Italy**, G. DEL GUERCIO (*Agr. Colon. [Italy], 12 (1918), No. 4, pp. 216–230, figs. 5; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 1, p. 1384*).—This pest was recorded for the first time in Italy during the summer of 1917, when it was observed to be a pest of beets in the lower Valdarno, near Florence.

The young larvæ begin to feed on the tender leaves of the beet in July and soon reach the root by tunneling. As a result the foliage withers and the development of the root is more or less stopped. Of the various control measures experimented with, arsenicals seem to promise good results.

**The distribution of the foxtail midge (Oligotrophus alopecuri) in Denmark and experiments in methods for its destruction.** S. ROSTRUP (*Tidsskr. Planteavl, 26 (1919), No. 1, pp. 38–51*).—Almost all of the seed of the meadow foxtail received at the State Seed Testing Station is said to be more or less severely attacked by the larvæ of this midge, and only where the plant has not previously been grown for seed and where there is but little grown can the seed crop escape severe infestation. The larvæ hibernate in the seed, where a large percentage survive thrashing, cleansing, and drying. Experimental destruction of the larvæ without dstroying the germinating power of the seed has shown that dry heat can be applied for 35 minutes to a temperature of 59 to 60° C. (138.2° to 140° F.), or the seed treated with carbon disulphid (1 gm. $CS_2$ per liter of air) for 9 hours.

**On the biology of M. ludlowi in Sumatra**, W. SCHÜFFNER, N. H. SWELLENGREBEL, J. M. H. SWELLENGREBEL DE GRAAF, and ACHMAD MOCHTAR (*Mededel. Burgerl. Geneesk. Dienst Nederland. Indië, No. 3 (1919), pp. 65–90, pls. 5*).—A detailed report of biological studies of *Myzomyia ludlowi*, an anopheline which

the authors' experiments show to be easily infected with parasites of pernicious and tertian malaria and much more so than all other species examined up to the time of writing. Experiments with the quartan type had not been concluded.

**A note on the flight of mosquitoes through horizontal water pipes**, W. W. KING (*Pub. Health Rpts. [U. S.], 34 (1919), No. 9, pp. 386–390, fig. 1; Sci. Amer. Sup., 87 (1919), No. 2255, p. 186*).—The author's observations, conducted in St. Thomas, Virgin Islands, with a species thought to be *Culex quinquefasciatus* are summarized as follows:

"Mosquitoes entered the left cisterns through unscreened perpendicular waterspouts 2.5 and 3 in. in diameter and 14 and 10 ft. high. Mosquitoes did not enter cisterns through larger unscreened waterspouts when these pipes had a horizontal section from 12 to 32 ft. long. No observations were obtained of a horizontal distance of less than 12 ft.

"Mosquitoes bred in the cisterns and septic tank and having no other means of exit passed through horizontal pipes 4 and 5 in. in diameter for a distance of 191 ft. in the longest instance, aided probably to a certain degree by air currents. No doubt they would pass through greater distances."

**Synopsis of the economic Syrphidæ of Japan**, S. MATSUMURA and J. ADACHI (*Ent. Mag. [Japan], 2 (1916), No. 1, pp. 1–26, pl. 1; 2 (1917), No. 4, pp. 133–156, pl. 1; 3 (1917), No. 1, pp. 14–46*).—This synopsis includes descriptions of 8 genera, 59 species, and 1 variety new to science.

**New species of the economic Syrphidæ of Japan**, S. MATSUMURA (*Jour. Col. Agr. Hokkaido Imp. Univ., 8 (1918), No. 1, pp. 31, pl. 1*).—Four genera are erected and 54 species are described as new, in addition to those recognized in the paper noted above.

**The biology of Dermatobia hominis observed in all its stages**, A. NEIVA and J. F. GOMES (*Ann. Paulistas Med. e Cirurg., Sao Paulo, 8 (1917), No. 9, pp. 197–209, fig. 1; abs. in Rev. Appl. Ent., Ser. B, 7 (1919), No. 4, pp. 65, 66*).—A report of observations on the biology of this parasite at Sao Paulo.

**Anthrax: Transmission of infection by nonbiting flies**, H. MORRIS (*Louisiana Stas. Bul. 168 (1919), pp. 3–12*).—This is a report of experiments conducted to determine the possibility of infection being carried to wounds of healthy animals by flies which have fed upon or developed in anthrax-infected material. The results of the work have been summarized by the author as follows:

"The house fly (*Musca domestica*) and the blue bottle or green bottle flies (*Calliphora erythrocephala, Lucilia cæsar*, and *L. sericata*), are capable of carrying anthrax infection to wounds on healthy animals, after having fed upon anthrax-infected flesh. The house fly and the stable fly (*Stomoxys calcitrans*) are capable of carrying anthrax infection to wounds on healthy animals after having fed upon the discharges from an open carbuncular swelling on an animal sick with anthrax. Flies bred out of an unopened anthrax carcass during the summer months in Louisiana do not carry anthrax infection. The results would indicate that flies bred in the presence of anthrax spores do carry anthrax infection. The results would indicate further that the vegetative form of anthrax in the unopened carcass is destroyed by the process of decomposition." It is pointed out that the results prove the necessity for prompt and complete destruction of all anthrax carcasses.

The author's report of an investigation relating to anthrax transmission by bloodsucking insects has been noted (E. S. R., 39, p. 161).

**A study of Compsilura concinnata, an imported tachinid parasite of the gipsy moth and the brown-tail moth**, J. J. CULVER (*U. S. Dept. Agr. Bul. 766 (1919), pp. 27, pls. 2, figs. 10*).—This is a report of investigations conducted, with a review of the present status of knowledge of this important larviparous

parasite, first introduced into Massachusetts from Europe in 1906. It occurs in Europe over practically all the territory covered by the brown-tail moth, attacking both nocturnal and diurnal hosts comprising 58 species, a list of which is given, together with a host list of 33 species recorded for this country. It is found in almost any part of New England within the gipsy moth area.

The account includes a discussion of the importation of this parasite into the United States, colonization, spread, recovery, classification, larval stage, life history, action on hosts other than the gipsy and brown-tail moths, seasonal history, secondary parasitism, superparasitism, and supernumerary parasitism. A map showing its distribution in New England, and points outside of such territory where it has been colonized, is attached.

In discussing its economic importance, it is pointed out that the white-marked tussock moth, which a few years ago was a serious pest in many localities in New England, has practically disappeared. The promethea moth (*Callosamia promethea*), which in past years was very common in the area covered by Compsilura, is now quite rare. The cabbage worm has been materially lessened in some sections. The celery worm (*Papilio polyxenes*) is not so common as previous to the importation of Compsilura, and the fall webworm, which was found in large numbers in eastern Massachusetts in 1910, is scarcely noticed now. While this parasite is not the sole cause of the disappearance of these pests, it is significant that the decrease has occurred since its introduction. The gipsy and brown-tail moth infestations have been materially lessened in sections where this parasite has been firmly established, and it appears to have played an important part in causing the decrease. It is the most important of the tachinids introduced for combating the gipsy and brown-tail moths, and attacks both freely.

A bibliography of the literature relating to *C. concinnata* and its specific synonyms is appended.

**Cane borer parasite work in 1919**, T. E. Holloway (*La. Planter, 63 (1919), No. 8, pp. 122, 123, fig. 1*).—This is a brief report on the status of tachinid parasites introduced from Cuba. Considerable numbers were introduced during the month of July, and colonization is being attempted in several localities in the cane-growing sections of Louisiana.

**Sugar cane and hardback grubs in Antigua**, H. A. Ballou (*Agr. News [Barbados], 18 (1919), No. 449, pp. 218, 219*).—This is a report of the imperial entomologist based on a trip to Antigua in March, 1919.

**Wireworm control, with special reference to a method practiced by Japanese growers**, R. C. Treherne (*Agr. Gaz. Canada, 6 (1919), No. 6, pp. 528–530*).—A method practiced by Japanese growers in the Okanogan Valley, B. C., where the onion crop in particular suffers very seriously from wireworm attack, consists of baits composed of rice shorts or rice bran and water, sunk in the soil. The rice shorts or bran is roasted dry in pans or on sheets of tin over a fire, being turned frequently as it browns. The shorts thus dried gives forth a pronounced odor, which is held by the Japanese to be the cause of attracting wireworms in the soil. The roasted shorts is moistened by a little water and molded by hand into small, compact balls, which are placed in shallow holes (made with a hoe) about 10 ft. apart between rows of onions and covered with soil. In a week or ten days the baits are scratched up, broken open, and the wireworms found therein are removed by hand and placed in small collecting boxes, after which the baits are remolded and reset to be examined in the same way a week or ten days later.

The author considers this method to have its merits, the number of wireworms apparently having been considerably reduced. Individual baits which had only been set one week in the soil yielded from 0 to 67 wireworms.

**Extermination of cotton boll weevil**, J. E. RANSDELL (*Cong. Rec., 58 (1919), No. 77, pp. 4399–4404*).—This discussion includes correspondence relating to the control of the boll weevil by dusting and a summary of the present status of the work up to August 1, 1919, by B. R. Coad.

**Shot-hole borer (Xyleborus fornicatus)**, E. R. SPEYER (*Dept. Agr. Ceylon Bul. 44 (1919), pp. 8*).—A control pruning scheme and its practical modification.

**Langstroth on the hive and honeybee**, DADANT (*Hamilton, Ill.: Dadant & Sons, 1919, 20. ed., pp. X+575, pls. 28, figs. 229*).—A revised edition of the work previously noted (E. S. R., 20, p. 1155), in which the principal changes relate to diseases of bees.

**Beginnings in beekeeping**, W. P. ALEXANDER (*Cornell Reading Course for the Farm, No. 138 (1918), pp. 73–96, figs. 13*).—A popular account.

**Eighteenth annual report of the Illinois State Beekeepers' Association**, J. A. STONE (*Ann. Rpt. Ill. State Beekeepers' Assoc., 18 (1919), pp. 218, figs. 13*).—The papers presented at the annual meeting are included in this report.

**Commercial comb honey production**, G. S. DEMUTH (*U. S. Dept. Agr., Farmers' Bul. 1039 (1919), pp. 40, figs. 14*).—This is a revision of Farmers' Bulletin 503, previously noted (E. S. R., 27, p. 865).

**Isle of Wight disease in hive bees**, J. RENNIE and E. J. HARVEY (*Scot. Jour. Agr., 2 (1919), No. 2, pp. 176–189*).—The authors report the results of work carried on in continuation of investigations previously noted (E. S. R., 37, p. 360). They conclude that the causal organism of Isle of Wight disease has not yet been found.

**Foul brood**, B. F. KINDIG (*Michigan Sta. Circ. 39 (1919), pp. 4*).—This is a supplement to Special Bulletins 58 and 64 previously noted (E. S. R., 31, p. 553), and relates to the control of European foul brood.

**Edema of the eyelids caused by ants**, A. J. CHAMBERS and A. MARSHALL (*Jour. Trop. Med. and Hyg. [London], 22 (1919), No. 12, p. 117, pl. 1*).—*Monomorium bicolor nitidiventre* is reported to have caused edema through its attaching to the eyelids of man in Anglo-Egyptian Sudan.

**New Chalcididæ**, E. MALENOTTI (*Redia, 13 (1918), No. 1–2, pp. 77–92, figs. 17; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 9, pp. 1122, 1123*).—With the discovery of *Aphelinus borelli* eight chalcidids are known to parasitize *Chrysomphalus dictyospermi*.

**Descriptions of four new parasitic Hymenoptera**, S. A. ROHWER (*Canad. Ent., 51 (1919), No. 6–7, pp. 160–162*).—*Tetrastichus rugglesi* reared as a parasite of *Agrilus arcuatus* at University Farm, St. Paul, Minn., and *Trigonura hicoriæ*, *Ecphylus hicoriæ*, and *Heterospilus blackmanni*, all three reared from pignut (*Hicoria glabra*) at Syracuse, N. Y., are described as new.

**The life history of a gall mite on Nephrolepis biserrata**, K. GIESENHAGEN (*Jahrb. Wiss. Bot. [Pringsheim], 58 (1917), No. 1, pp. 66–104, pls. 2, figs. 3*).—A detailed report of studies of *Eriophyes nalepaï*.

**Second memorandum on acarids (mites) occurring in stored grain and flour**, R. NEWSTEAD and H. M. DUVALL (*Roy. Soc. [London], War Committee Memo. 4 (1918), pp. 11, pls. 2*).—The first part of this memorandum deals briefly with the life history and habits of *Alcurobius farinæ*, *Glyciphagus cadaverum*, *Cheyletus eruditus*, and *Acarophenax tribolii;* the second part, with economic and experimental work with acarids in stored grain and in flour. A more detailed account has been previously noted (E. S. R., 40, p. 855).

**The amount of food eaten by the spider (Aranea sericata)**, C. E. NEBEL (*Trans. Wis. Acad. Sci., Arts, and Letters, 19 (1918), pt. 1, pp. 524–530*).—This paper deals with the amount of food eaten by seven specimens of *A. sericata*, and the amount which they gained or lost in weight during a period of four months in which the fruit or pomace fly ([*Drosophila*] *Melanogaster ampe-*

*lophila*) raised on overripe bananas was used as food. The data, which are presented in tabular form, show that a spider will consume an average of 2.5 pomace flies per day. The author made counts in representative fields in Wisconsin and found approximately 10,000 Araneas to an acre of land.

**Acanthocephala from the Illinois River, with descriptions of species and a synopsis of the family Neoechinirhynchidæ**, H. J. Van Cleave (*Ill. Dept. Registr. and Ed., Div. Nat. Hist. Survey Bul., 13 (1919), Art. 8, pp. IV+225–257, pls. 7*).—This account of Acanthocephala from fresh water hosts includes a bibliography of 34 titles.

**Studies on the parasites of the termites, I–IV**, C. A. Kofoid and O. Swezy (*Univ. Cal. Pubs. Zool., 20 (1919), Nos. 1, pp. 1–20, pls. 2, fig. 1; 2, pp. 21–40, pls. 2, figs. 2; 3, pp. 41–98, pls. 8, figs. 4; 4, pp. 99–116, pls. 2, fig. 1*).—These papers deal, respectively, with *Streblomastix strix*, a Polymastigote Flagellate with a Linear Plasmodial Phase; *Trichomitus termitidis*, a Polymastigote Flagellate with a Highly Developed Neuromotor System; *Trichonympha campanula* n. sp.; and *Leidyopsis sphærica* n. g. and n. sp.

## FOODS—HUMAN NUTRITION.

**The zinc content of some food products**, V. Bieckner (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 191–203*).—The zinc determinations reported in this contribution from the Bureau of Chemistry, U. S. Department of Agriculture, were made by slight modifications of the turbidimetric method suggested by Breyer in Scott's Standard Methods of Chemical Analysis (E. S. R., 37, p. 310). The zinc was precipitated as sulphid from the chlorid instead of the sulphate. The turbidity test with potassium ferrocyanid was carried out in Nessler jars, the comparison with the standards being made by looking vertically through the jars at a printed paper placed underneath. The method, if carried out according to the technique described in detail, is said to be accurate within ± 0.05 mg., provided the amount of zinc in the sample is below 0.5 mg. Sources of error to be guarded against are a loss of zinc during ignition and an incomplete precipitation of the zinc sulphid due to an excessive concentration of formic acid.

The zinc content of a number of food materials determined by this method is reported. The zinc in market milk ranged from 3.6 to 5.6 mg. per kilogram of milk, the average of 12 determinations being 4.2 mg. The zinc content of milk of individual cows varied somewhat in different animals and at different stages of lactation, being highest during the early part of the lactation period. The so-called "neutralization precipitate" of cow's milk, described by Osborne and Wakeman (E. S. R., 36, p. 862) contained nearly all of the zinc of the original milk. The zinc content of human milk was considerably higher than that of cow's milk in spite of the higher total ash content of the latter.

In hen's eggs practically all of the zinc was found in the yolk, amounting to about 0.005 per cent of the yolk or a total amount of about 1 mg. per egg. Zinc was also found in varying amounts in tap water, soy beans, peas, carrots, bone ash, baker's yeast, barley malt, various cereals, agar, gelatin, and in large amounts in oysters.

The normal occurrence of zinc in such important animal products as milk and eggs, as well as in many other foods, is thought to be an indication that it exerts some important nutritive function, the nature of which is not at present understood.

**Zinc in oysters**, R. S. Hiltner and H. J. Wichmann (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 205–221*).—This paper reports the results of a series of studies made in the laboratories of the Bureau of Chemistry, U. S. Department

of Agriculture, at New York, Philadelphia, Boston, and Denver of the occurrence of zinc and copper in oysters from various localities on the Atlantic seaboard, the relation of zinc in oysters to the zinc content of the water in which they grew, and the ratio of zinc to copper in oysters.

Copper and zinc were determined in one weighed portion (100 gm.) of a homogenous sample obtained by thoroughly comminuting at least a pint of the oysters. After preliminary destruction of organic matter by the acid digestion process, the copper was separated from the zinc by precipitation from slightly acid solution with hydrogen sulphid, and the zinc determined by titration from its chlorid with a standardized solution of potassium ferrocyanid.

Zinc was found in all the oysters examined and was always associated with copper. There appeared to be no direct relation between the zinc content and the body weight of the oysters, nor uniformity of ratio of zinc to copper, nor correlation between the zinc content of the oysters and the water in which they grew. As the vegetable and organic matter dredged up with oysters in the single locality studied contained considerable zinc and in some instances traces of copper, the possibility is suggested that the zinc content of the oyster is an indication of the character of its food rather than of the character of the sea water in which it grows. "It seems probable that zinc, as well as copper, can be absorbed and retained in the tissues of the oysters in quantities far in excess of functional requirements, especially in oysters grown in waters badly polluted with metallurgical and factory wastes."

The blue or bluish green coloration noticeable in some oysters is said to be a reliable indicator of the presence of large amounts of copper and indirectly of zinc, with which it is always associated.

**The normal existence of zinc in the human organism**, C. Ghigliotto (*Ann. Falsif., 12 (1919), No. 123–124, pp. 12–14*).—The author reviews conflicting statements in the literature as regards the presence of zinc in the human body, and reports the results of the examination of the viscera of 22 victims of accidental death. The content of zinc oxid found varied from 0.0015 to 0.0028 per cent of the viscera. Zinc was also found in a human and a bovine fetus. This is thought to be an indication that zinc is a normal constituent not only of the human organism but of the animal organism in general.

**The nutritive value of yeast protein**, T. B. Osborne and L. B. Mendel (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 223–227, fig. 1*).—The authors report that they have kept rats successfully for more than a year, covering the period of growth, upon a diet in which brewers' yeast furnished the sole source of nitrogen as well as water-soluble vitamin. The yeast comprised from 30 to 40 per cent of the ration, probably representing an actual protein concentration of less than 18 per cent. The nitrogen utilization as estimated by a comparison of the feces with the intake was from 74 to 83 per cent.

When bred with vigorous females which had grown up on a normal mixed diet, two of the animals proved to be fertile but produced inferior young while two others failed to breed. The testes of the latter showed an absence of germ cells. The authors are, however, of the opinion that this infertility is not caused by the yeast per se, and that there is no toxic factor present in the yeast.

**Is lactalbumin a complete protein for growth?** A. D. Emmett and G. O. Luros (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 147–159, figs. 7*).—Recent conflicting opinions as to the growth-promoting value of lactalbumin are reviewed and discussed, particularly those of Osborne, Mendel, et al (E. S. R., 37, p. 864) that lactalbumin is a complete protein, and of McCollum, Simmonds, and Parsons (E. S. R., 40, p. 762) that it is incomplete and that the excellent results obtained by Osborne and Mendel were due to the nitrogenous matter in the protein-free milk employed. The present contribution to the question is the re-

port of a study of the growth-promoting property for rats of rations containing lactalbumin as the sole protein and differing only in respect to the kind of synthetic protein-free milk used. From the results obtained the following conclusions were drawn:

"Lactalbumin is a complete protein in the sense that it does not lack any of the nitrogenous cleavage products essential for growth. It can supplement a deficient growth-promoting protein (corn gluten) and, incorporated as the sole protein in a ration containing lactose, it produces a normal rate of growth when present to the extent of only 10 per cent. Lactalbumin is a protein which either is sensitive to certain toxic substances, and under these conditions growth is retarded unless adequate adjustment is made in the diet; or it is a protein which does not appear to be able to absorb what we tentatively designate as a vitamin (other than water-soluble B).

"Lactose seems to be the essential constituent in the protein-free milk that contributes the accessory which makes an otherwise incomplete lactalbumin diet bring about normal growth in rats. Lactose, when added to a lactalbumin diet, either may have the physiological property of overcoming the toxicity that inhibits growth taking place, or else it may carry a water-soluble vitamin (other than water-soluble B) which appears to be essential to growth."

**The stability of lactalbumin toward heat,** A. D. Emmett and G. O. Luros (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 257–265, figs. 7*).—Continuing the investigations on the growth-promoting value of lactalbumin noted above, a study is reported of the effect of heat upon the nutritive value of lactalbumin as determined by feeding experiments with rats on a basal diet of protein-free milk 28 per cent; butter fat 5, 18, or 28 per cent; lard none or 10 per cent; and starch to make up the balance after adding the protein (10 per cent lactalbumin subjected to different temperatures up to 6 hours in the autoclave at 15 lbs. pressure).

The data obtained indicate that "high temperatures do not influence the growth-promoting value of lactalbumin when dried in vacuo at 55°, or heated in an air oven at 90 to 100° for 16 hours, or in an autoclave at 15 lbs. pressure for 2 to 6 hours, respectively; that the amount of butter fat, whether 5, 18, or 28 per cent, when used with a 2-hour-autoclaved lactalbumin, has no influence on the rate of growth; that heated lactalbumin is not toxic for young growing rats."

The authors correlate these results with the somewhat conflicting results obtained by McCollum and Davis (E. S. R., 34, p. 368), Funk and Macallum (E. S. R., 36, p. 160), and Hogan (E. S. R., 37, p. 467) with heated casein, on the hypothesis noted in their previous communication that there is a vitamin factor involved which is different from water-soluble B at least in being unstable toward heat.

In the diets in which satisfactory results were obtained with heated casein or lactalbumin, this vitamin is thought to be furnished probably by the lactose of the protein-free milk.

**Distribution of the antineuritic vitamin in the wheat and corn kernel.—A contribution to the biology of the antineuritic vitamin,** C. Voegtlin and C. N. Myers (*Amer. Jour. Physiol., 48 (1919), No. 4, pp. 504–511, figs. 4*).—The investigation reported was conducted on adult pigeons, series of which were fed on the following mixtures: Degerminated corn (corn kernel from which the germ had been removed); 90 per cent degerminated corn, 5 per cent purified casein, and 5 per cent salt mixture; 85 per cent degerminated corn, 5 per cent purified casein, 5 per cent salt mixture, and 5 per cent butter fat; whole corn; and degerminated wheat.

The results obtained are considered to indicate that removal of the germ or embryo from corn and wheat deprives these cereals of their antineuritic vitamin, that is, that the antineuritic substance is located entirely in the embryo of the grain. This suggests that this accessory food is necessary for the metabolism of the growing plant as well as the animal body. A table compiled from the observations of various authors is given showing the occurrence of this vitamin in cells with an especially active metabolism.

Attention is also called to the bearing of the results of the study on the question of the nutritive value of bread. The advisability is suggested of so altering the milling process as to allow the germ of the cereal without the bran to be incorporated in the finished flour.

**Food flours and their derivation products**, E. Collin (*Ann. Falsif., 11 (1918), No. 121–122, pp. 372–384, figs. 7; 12 (1919), No. 123–124, pp. 14–29, figs. 10*).—The physical and microscopical characteristics of flour prepared from wheat, barley, maize, rice, buckwheat, potatoes, tapioca, durra, bananas, chestnuts, soy beans, cacao beans, oil cake, and algæ are described and suggestions given for their detection in mixed flours and in bread. The value of several of these flours as wheat substitutes is discussed.

**Digestibility of bacon**, K. Blunt and M. G. Mallon (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 43–48, fig. 1*).—Digestion experiments with normal young women on a diet of bacon, shredded wheat biscuit, orange juice, and sugar were conducted to determine the coefficients of digestibility and utilization of bacon fat, the former coefficient representing the percentage of fat hydrolyzed as calculated from the neutral fat found in the feces, and the latter representing the percentages of fat hydrolyzed and absorbed as calculated from the free fatty acids found in the feces.

The average percentage of digestion of the fat of slightly cooked bacon was 96.3, and of the thoroughly cooked, 97, while the average percentages of utilization were 92.8 and 95, respectively. Later experiments in which moderately cooked bacon was used gave coefficients of utilization of 96.2, 95.7, and 96.5 per cent. While the nitrogen of the diet was not so well utilized (79.8 to 80 per cent), the low figures are thought to be due not to the bacon nitrogen but to the shredded wheat.

**The ripening of sausage**, E. P. Césari (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 15, pp. 802, 803*).—The ripening of sausage is thought to be due to the action of certain yeasts which possess a moderate proteolytic power and the property of producing aromatic products. The possibility is suggested of modifying advantageously the natural ripening by inoculating the paste with pure cultures of the yeasts in question, selected to obtain the most pleasing odor and taste.

**Beverages and their adulteration**, H. W. Wiley (*Philadelphia: P. Blakiston's Son & Co., 1919, pp. XV+421, pls. 2, figs. 40*).—The subjects treated in this companion volume to Foods and Their Adulteration (E. S. R., 40, p. 459) are waters, soft drinks, fruit juices, coffee, tea, cocoa, chocolate, fermented and distilled beverages, alcoholic remedies, and beverages containing cocaine. The description of each beverage includes its origin, methods of manufacture, composition, the proper conditions attending its transportation and use, and the common adulterations and misbrandings.

**The gastric response to foods.—II, A fractional study of the coagulation of milk in the human stomach**, O. Bergeim, J. M. Eyvard, M. E. Reifuss, and P. B. Hawk (*Amer. Jour. Physiol., 48 (1919), No. 4, pp. 411–418, pls. 3, figs. 2*).—By the use of a normal man who was able to regurgitate at will, an extensive investigation was made of the coagulation of milk in the human stomach. Studies of two kinds were made, one in which small samples of stomach con-

tents were regurgitated at intervals throughout the curding period of the milk, the other in which the stomach was completely emptied a half hour after a pint of milk had been ingested. The results obtained, which are described and illustrated by photographs, may be summarized as follows:

Milk drunk rapidly left the stomach sooner and produced a smaller curd mass than milk drunk slowly or sipped. Raw whole milk formed firm, white, rubber-like curds, the maximum curd formation taking place about one hour after the milk had entered the stomach. Milk which had been boiled five minutes formed small, soft, flaky, yellow curds which left the stomach sooner and were much more easily digested than the tough curds from the raw milk. A mixture of 80 per cent boiled whole milk and 20 per cent raw whole milk gave curds similar in character to those obtained from the ingestion of raw whole milk. These results would indicate that, dietetically, boiled milk is to be preferred to the raw product except for the fact that its antiscorbutic value may have been lowered.

Skim milk formed large, harder curds than whole milk. The curds of raw milk were larger and harder than those of the boiled milk. The fat content is considered to be an important factor in determining the character of the curd in milk. In general the more fat the less curd, and the smaller and softer the curd. When 40 per cent cream was drunk, no curds were formed during the first half hour. Milk of high fat concentration was also very slow to leave the stomach.

The curds of pasteurized milk were intermediate in character between the curds of raw and boiled milk. The drinking of water before the milk was ingested tended to make the curds somewhat smaller and softer. The temperature of the milk was found to have but little effect on time of curd formation, although lowering the temperature had a slight tendency to delay the formation of curds.

**The minimum of sugar and fat**, H. Bierry (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 3, pp. 124–127*).—Arguments are given to prove the necessity of a minimum of fat as well as a minimum of carbohydrate (E. S. R., 40, p. 563) in the diet. The importance of certain fats in furnishing vitamins is pointed out.

**Nutritional studies on the growth of frog larvæ (Rana pipiens)**, A. D. Emmett and F. P. Allen (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 325–344, pls. 4, fig. 1*).—This is a preliminary report of a series of nutritional studies in which tadpoles were used in place of larger animals for the purpose of determining facts regarding their nutrition with respect to size and degree of metamorphosis. Immediately after hatching, the tadpoles were placed in enameled trays in groups of 500 each and fed at specified times on synthetic diets so arranged as to show the effect of various modifications. The record of progress of growth was obtained by means of photographs taken each week of a selected group from each colony. Histological studies were also made of representative specimens. The results are summarized of the effect of diet upon the size and upon the development of hind legs of the tadpole, and the following tentative conclusions drawn:

A large amount of fat in the diet was very injurious to both growth (body size) and development of hind legs. Vitamins of both the water-soluble and fat-soluble type appeared to be necessary for normal growth and development. The lack of water-soluble B was slightly more apparent than that of fat-soluble A. The amount of protein, from 10 to 20 per cent of lactalbumin, seemed to have little effect on the development of hind legs whether both vitamins, one, or neither were present, but the high protein-fed tadpoles were largest when both vitamins were present. The quality of the protein was an important factor in

the rate of development. No difference was noted between dextrin and starch as to the effect either on growth or development.

The results as a whole are thought to indicate definitely the possibility of so adjusting the diet by means of variations in such nutrients as fat, protein, and vitamins, as to alter the size of the tadpole and the rate of metamorphosis. Attention is, however, called to other factors, such as temperature and food control, which also play an important part.

A biological analysis of pellagra-producing diets.—VI. Observations on the faults of certain diets comparable to those employed by man in pellagrous districts, E. V. McCollum, N. Simmonds, and H. T. Parsons (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 113–146, pl. 1, figs. 10*).—In continuation of the series of studies on pellagra-producing diets previously noted (E. S. R., 40, p. 69), the authors present the results of feeding experiments with rats on diets comparable to those employed by man in pellagrous districts, together with similar experiments in which such diets were supplemented by food additions containing the factors (proteins, certain salts, and fat-soluble A) which previous study had shown to be deficent in the so-called pellagra-producing diets.

The results of the studies reported show that in no case was a condition analogous to pellagra in man produced in the rats, although all showed a generalized poor condition as evidenced by slight deformities, early aging, and inability to produce and rear young successfully. This condition was remedied in varying degrees by the addition to the diet of salts, leafy vegetables, meat powder, and milk or milk powder.

In connection with the interpretation of these results a detailed discussion is given of previous work by the authors and other investigators on the relation of diet to pellagra. The evidence as a whole is considered by the authors to support the conclusions of Siler, Garrison, and MacNeil (E. S. R., 31, p. 858) "that pellagra is caused by an infectious agent, and that unless it has been introduced into a district there may develop such a condition of lowered vitality from faulty diet or other debilitating influence as would predispose one to an attack, without the appearance of the disease. The debilitating effects on animals of diets derived from cereals, tubers, roots, and any food products formed from the milling of grains, together with legume seeds and meats, are so striking that we believe similar diets would produce in man a susceptibility to infectious diseases such as tuberculosis or pellagra. We have come to hold the view . . . that the predisposing influence for both is in general the same, and the character of the unsanitary conditions surrounding the individual may determine which of these two diseases he will develop."

In discussing the relative values of several foods as correctives in the diet of the pellagrous, the authors recommend the regular and liberal use of leafy vegetables, and above all the inclusion in the diet of a suitable amount of milk because of its cheapness.

Biochemical studies of the saliva in pellagra, M. X. Sullivan and K. K. Jones (*Pub. Health Rpts. [U. S.], 34 (1919), No. 20, pp. 1068–1080*).—A study of the mixed saliva of individual pellagrins at the pellagra hospital of the U. S. Public Health Service at Spartanburg, S. C., was undertaken to determine whether the saliva, from a biochemical standpoint, differed from that of normal individuals.

The rate of flow and diastatic power were found to vary within the limits established by normal controls. The specific gravity was slightly higher than that of the controls. Total solids, ash, organic matter, and mucin were also higher, but the differences are thought to bear no relation to the mouth symptoms. The sulphocyanate content was much less marked, indicating that in pellagra patients there is both a lessened protein intake and a detoxicating

power feebler than normal. The reaction of the saliva in pellagra was somewhat more alkaline than that of normal saliva.

Medical studies in Roumania during the war, especially the treatment and etiology of pellagra, L. Külz (*Arch. Schiffs u. Tropen Hyg., 22 (1918), No. 22–23, pp. 401–430*).—Several diseases intensified by war conditions in Roumania are discussed. These include typhus, malaria, dysentery, scurvy, pellagra, and other diseases of minor importance. The author attributes the large number of cases of pellagra to the extensive consumption of corn, three factors being considered responsible for determining the incidence of the disease: (1) The amount of corn consumed, (2) the quality of the corn, and (3) individual susceptibility. It is pointed out that when corn forms only a small fraction of the diet pellagra does not occur, but that increase in the amount of corn consumed is invariably accompanied by an increase in pellagra. All corn, even fresh, is thought to contain the substance which is the primary cause of the disease, but the amount of this toxic substance increases as the corn deteriorates so that a much smaller amount of spoiled than of fresh corn is necessary to produce the disease. Individual variations in susceptibility are illustrated by the fact that not all members of the family on the same diet become pellagrous. In treating the disease, the author recommends the elimination of corn from the diet and the administration of iron, iodin, and arsenic, the latter in the form of neosalvarsan.

Studies of experimental scurvy.—Effect of heat on the antiscorbutic properties of some milk products, E. B. Hart, H. Steenbock, and D. W. Smith (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 305–324, figs. 20*).—The authors report studies of experimental scurvy in guinea pigs, the results of which confirm the conclusions of Chick, Hume, and Skelton (E. S. R., 40, p. 272) on the quantitative relation of raw milk consumption to the development of a scorbutic condition in the guinea pig, and refute the hypothesis of McCollum and Pitz (E. S. R., 38, p. 568) that scurvy is related to intestinal putrefaction and retention of the feces. In addition, data are given indicating that commercial condensed milks, commercial milk powders, and milk sterilized for 10 minutes at 120° C. do not possess antiscorbutic properties when used in quantities equivalent to an amount of raw milk which would prevent scurvy in guinea pigs on a diet of rolled oats and dried hay.

The antiscorbutic properties of concentrated fruit juices (*Jour. Roy. Army Med. Corps, 32 (1919), No. 1, pp. 48–56*).—In the first part of this paper, by A. Harden and R. Robison, feeding experiments with guinea pigs are reported which show that the antiscorbutic principle in orange juice is not volatilized when the juice is distilled at 40° C. under reduced pressure. The solid residue obtained by this process was found to have strong antiscorbutic properties which were not appreciably diminished on keeping the substance in a dry atmosphere at room temperature for six months.

In the second part, by R. Robison, an extension of the investigation to other fruit juices is reported. Lime juice concentrated in the Kestner evaporator under reduced pressure was found to retain nearly all of its antiscorbutic value, although the acidity of the concentrated juice rendered it rather unsatisfactory in the guinea pig experiments. Apple juice concentrated in the same manner to about one-sixth of its original volume formed a soft palatable jelly of valuable antiscorbutic properties, although not in the same degree as the dried orange juice.

The general use of fruit jellies prepared by this or similar processes is recommended as a substitute for ordinary jams or jellies wherever there is reason to suspect that the diet is deficient in the antiscorbutic principle.

**The time of appearance of the antiscorbutic substance in germinating barley and the harmful effect on guinea pigs of barley in different stages of germination,** E. Weill and G. Mouriquand (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 5, pp. 184–186*).—The authors by feeding guinea pigs with barley in different stages of germination have confirmed the conclusions previously noted (E. S. R., 40, p. 565) that barley, after three days' sprouting, does not possess antiscorbutic properties, but on the contrary causes a more acute form of scurvy, although appearing later.

The first appearance of the antiscorbutic property was after five days' germination. Guinea pigs fed on barley which had germinated for five days or longer did not develop scorbutic symptoms, but frequently succumbed after varying intervals of time to what appeared to be an acute intoxication. When the feed consisted of a mixture of 40 gm. of barley germinated for three days and 20 gm. of the green or white growth of 10 days' germination no symptoms of scurvy or acute poisoning appeared, each substance apparently neutralizing the harmful effect of the other.

**Changes in the teeth of the guinea pig produced by a scorbutic diet,** S. S. Zilva and F. M. Wells (*Proc. Roy. Soc. [London], Ser. B, 90 (1919), No. B 633 pp. 505–512, pl. 1*).—To study the effect of a scorbutic diet on the teeth, microscopical examination was made of sections of decalcified teeth of guinea pigs in normal condition and in various stages of scurvy.

Two important features disclosed by these experiments are that the tooth is one of the first, if not the first, part of the system to be affected by a deficiency of antiscorbutic material, and that changes of a profound nature occur in the teeth even when scorbutic symptoms during life are so slight as to be almost unrecognizable. The degeneration appears to be complete pulpar fibrosis, the fine cellular connective tissue of the normal tooth being replaced by a fibrous structure devoid of cells, nuclei, etc. Similar radical changes in the teeth have also been noted in monkeys on a scorbutic diet.

In discussing the application of these results to human nutrition, the authors suggest the possibility that dietary deficiency is an important factor in the great prevalence of tooth decay in civilized communities. They point out that cases of scurvy so mild as to escape detection may occur more often than is usually suspected and may reasonably be expected to influence dentition.

**The effect of diet on the healing of wounds,** A. H. Clark (*Bul. Johns Hopkins Hosp., 30 (1919), No. 339, pp. 117–120, figs. 5*).—The effect of diet on wound healing was studied by producing artificial wounds in dogs on specific diets and observing the rate of healing of the wound.

The length of the initial quiescent period of wound healing was found to be affected by the diet, varying from zero in dogs fed on protein, 3 days on carbohydrate and 4 days on mixed diet to 6 days on fat. This variation was more marked in smaller wounds. The subsequent periods of contraction, epidermization, and cicatrization were apparently not affected by the diet.

In conclusion the author points out that the results obtained confirm the suggestion of Benedict and Carpenter (E. S. R., 40, p. 270) that proteins have a specific influence in stimulating the whole cellular system to greater activity.

## ANIMAL PRODUCTION.

**Cattle feeding on pasture,** W. A. Cochel (*Breeder's Gaz., 76 (1919), No. 8, pp. 307, 308, fig. 1*).—This is an outline of the methods of beef production on pasture lands, with a brief note on the distribution of common grasses in the grazing areas of the United States.

**The cattle of eastern France**, E. N. WENTWORTH (*Breeder's Gaz., 76 (1919), No. 8, p. 311*).—This is a note on the triple-purpose cattle of the eastern Departments of France. There are four breeds of economic importance in this section, the Friburg, the Simmental, the Brown Swiss, and the Jurassic. The first named is the most popular, and the better cows are said to give over 40 lbs. of milk daily. The last is a native breed, taking its name from the Department of Jura. A movement for its rehabilitation has been inaugurated. It is claimed to be very resistant to tuberculosis, has a strong constitution, and is apparently capable of higher milk yields than the Friburg.

**Present state of sheep breeding in Canada**, J. R. ARKELL (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 10, pp. 1333–1338*).—The progress of the sheep industry in Canada since the founding of cooperative associations of wool producers under government supervision in 1912 is briefly outlined.

The decennial census reports from 1871 to 1911 and annual reports from 1912 to 1916 as to the number of sheep in the several Provinces are tabulated.

**Genetic studies in poultry.—I, Inheritance of leg-feathering**, R. C. PUNNETT and P. G. BAILEY (*Jour. Genetics, 7 (1918), No. 3, pp. 203–213*).—Experimental crosses are reported between feather-legged (Langshan) and clean-legged (Brown Leghorn and Golden Pencilled Hamburg) fowls. The $F_1$s in general were moderately feathered, but there was considerable variation and one of the hens of the Hamburg cross was clean legged, although she produced feather-legged offspring by a clean-legged cock. The Leghorn $F_2$s consisted of 323 feathered and 106 clean-legged chicks, and the Hamburg $F_2$s of 117 and 31, respectively. These are considered good approximations to 3:1 ratios.

Individual $F_2$s that seemed to be homozygous for feathering were identified. Some $F_2$s were more heavily feathered than typical Langshans. Moderately-feathered birds mated to clean-legged ones frequently produced strongly-feathered offspring; in such matings more males than females were heavily feathered. Modifying factors are postulated to explain these facts.

On the basis of Davenport's data (E. S. R., 23, p. 75), it is suggested that two factors are responsible for the leg-feathering in Cochin and Dark Brahma bantams.

**On the sterility of hybrids between the pheasant and the Gold Campine fowl**, D. W. CUTLER (*Jour. Genetics, 7 (1918), No. 3, pp. 155–165, pl. 1*).—The author has examined histologically the testes of about a dozen male hybrids resulting from crosses between male pheasants (no species designated) and domestic hens of the Golden Campine breed, and has also studied spermatogenesis in pheasants and in Golden Campine cocks. The breeder who made the crosses secured no female hybrids with one doubtful exception. The hybrids, it is stated, were all sterile.

Technical difficulties made chromosome counts uncertain. The hybrids showed 19 to 21 in the spermatogonia, the pheasants 20 to 22, and the domestic fowl 18 to 20. The following quotation, from which references to figures have been omitted, summarizes the other conditions found in the hybrids:

"The early development of the primary spermatocytes is normal; a granular spireme is formed which retracts to one side of the nucleus, producing a closely packed mass of threads. . . . The synaptic threads, instead of breaking into bivalent chromosomes, form a varying number of irregularly shaped clumps of chromatin. There is no uniformity as regards the number produced, and a series can easily be formed in which the number varies from two to three large masses up to the condition where the chromosomes are almost all bivalent, or where many have separated as univalents. This failure of the synaptic threads to form bivalent chromosomes is evidently the cause

of the sterility in the hybrids. This is the final stage in spermatogenesis, for divisions of the primary spermatocytes do not occur nor is there any trace of abnormal mitoses."

**Partial self-fertilization contrasted with brother and sister mating,** R. B. ROBBINS (*Jour. Genetics, 7 (1918), No. 3, pp. 199–202*).—If a fixed proportion of the individuals of each generation of an ideal population reproduce by self-fertilization and the remainder by random pairing, and if only a single typical Mendelian character is considered with respect to its distribution in successive generations, the author finds by the use of algebraic methods that heterozygotes can never entirely disappear and that the proportion present steadily approaches a definite limit different from zero. The claim of Bruce (E. S. R., 37, p. 769) that this mixed type of reproduction would give results essentially similar to brother and sister mating is thus disproved, for in a previous communication (E. S. R., 38, p. 367) the author shows that in continued brother and sister mating the heterozygotes do tend to disappear.

**On the nature of size factors,** S. WRIGHT (*Genetics, 3 (1918), No. 4, pp. 367–374*).—The author announces a theorem in the calculus of correlation whereby the observed correlation between two structures or organs of the body can be expressed as a function of those fractions of the variation in each of the characters which result from the same "causes." By making certain simplifying assumptions, it is thus possible to estimate the relative influence of those hereditary size factors which affect the animal body as a whole and those which affect only a particular part.

The method is applied to data published by MacDowell (E. S. R., 32, p. 573) on the length and width of skull and the lengths of humerus, femur, and tibia in rabbits. It was found that general body factors could be assigned from 62 to 75.5 per cent of the influences which determine the magnitude of the individual dimensions, that 6.6 to 31.5 per cent resulted from factors operating on a particular dimension and not on any of the others, while the remainder could be attributed to causes acting on more or less independent groups of bones. The skull bones form one such group and the leg bones another. The femur and tibia also form a subgroup subject to certain influences not affecting the humerus, while the femur and humerus, which are homologous bones, are influenced by another set of factors independently of the tibia.

## DAIRY FARMING—DAIRYING.

**Dairying with purchased feeds only,** F. W. WOLL (*Hoard's Dairyman, 58 (1919), No. 1, pp. 5–7, figs. 9*).—This is an account of a profitable dairy herd where 330 Holstein cows receive only purchased feeds. It is operated by a creamery company near Los Angeles, Cal., on land worth over $500 per acre. Low producers are speedily discarded and the cows in the herd average about 1 lb. of butter fat daily per head. Four per cent, grade A, milk is sold for $4 per hundredweight. The concentrates fed to all animals are coconut meal, wheat bran, and dried beet pulp, while cows that are milked three times daily receive in addition rolled oats and bran. A relatively high proportion of concentrates is fed, a profitable practice with high producers when alfalfa hay is $22 a ton. Corn for silage is contracted for at $3.50 a ton, but charges for hauling and labor add $1.50 or more to the cost. Considerable income is derived from the sale of manure and young stock.

**Factory butter, cheese, and condensed milk production during the war,** T. R. PIRTLE (*Hoard's Dairyman, 57 (1919), No. 20, p. 1000, fig. 1*).—Data from the census of 1909, the manufacturing census of 1914, and the reports issued by the Bureau of Markets of the United States Department of Agriculture on

the production of factories in 1916, 1917, and 1918, are briefly summarized to show the amounts of milk used in the United States in the manufacture of creamery butter, cheese, and condensed and evaporated milk. In 1918 more milk was used by condensories than by cheese factories.

## VETERINARY MEDICINE.

Proceedings of the Wisconsin Veterinary Medical Association fourth annual meeting, held at Madison, Wis., January 14, 15, and 16, 1919, edited by F. B. HADLEY (*Proc. Wis. Vet. Med. Assoc., 4 (1919), pp. 128, figs. 15*).—Among the papers here presented are the following: Hairless Pigs, by E. B. Hart (pp. 32–36); Swine Plague, by L. G. Hart, jr. (pp. 36–39); Barley for Fattening Pigs, by F. B. Morrison and G. Bohstedt (pp. 39–47); The Hog Cholera Situation in Wisconsin, by J. T. Purcell (pp. 47–49); The Outlook for the Veterinarian in the Philippines, by G. San Agustin (pp. 50–54); Hemorrhagic Septicemia, by W. L. Richards (pp. 54–57); A New Vaccine Against Contagious Abortion, by F. B. Hadley (pp. 57–61); Report of the State Detention Farm for Tuberculous Cattle, by O. H. Eliason and J. P. West (pp. 61–68); Bots in Horses, by S. B. Fracker (pp. 69–72); Necrobacillosis in Pigs, by J. B. Collins (pp. 72–74); Report of Board of Veterinary Examiners, by T. H. Ferguson (pp. 74, 75); and A Few Cases of Traumatic Pericarditis in Cows, by H. Lothe (pp. 75–81).

[Report of] veterinary research, A. THEILER (*Union So. Africa Dept. Agr. Rpt., 1917–18, pp. 55–58*).—A brief account of investigations conducted during the year.

Reports of the National Serum Institute, Holland, 1916–17, J. POELS (*Verslag Rijksseruminricht. [Netherlands], 1916–17, pp. 79*).—These are the reports of the institution for 1916 and 1917, containing the usual data (E. S. R., 38, p. 180).

Notes on the hydrocyanic acid content of jowar (Andropogon sorghum), MANMATHANATH GHOSH (*Agr. Jour. India, 14 (1919), No. 1, pp. 106–115*).—The author concludes that the weather, particularly the rainfall, is mainly responsible for the development of the poisonous elements in the jowar, and that the soil is only of minor importance and accountable only so far as it can hold up nitrogenous food materials to the plant.

Comparative toxicity of triphenylmethane and flavin dyes for tissue and bacteria, J. H. MUELLER (*Jour. Path. and Bact., 22 (1919), No. 3–4, pp. 308–318, figs. 2*).—The technique employed to determine the relative toxicity of various triphenylmethane and flavin dyes for tissue and bacteria was as follows:

Small fragments of chick embryos were suspended in a Petri dish in sterile Ringer's solution which had been first inoculated with several drops of a 24-hour broth culture of the organism desired. The medium used for the culture was chicken plasma, which was kept in paraffined tubes on ice and diluted at the moment of making the culture with an equal volume of a solution of the antiseptic in Ringer's solution of twice the concentration desired in the culture. After thorough mixing, a small drop of the plasma containing the dye was placed on a cover-glass and, after adding a fragment of the inoculated tissue, the cover-glass was sealed with vaselin on a hollow-ground slide. Growth was observed in 24 and 48 hours. The bacteria used for testing were streptococci, staphylococci, *Bacillus coli*, and *B. pyocyaneus*. In addition to the tissue experiments, the inhibitive action of the various dyes upon the bacteria in broth culture was also tested.

In the broth experiments the streptococcus was always the first of the bacteria to show inhibition and the pyocyaneus the last, but a great variation was

observed in the interval between the two with different dyes. The flavins apparently showed no specific action, while the triphenylmethane dyes showed a definite specificity for one or another type of organism. Malachite and brilliant green affected the streptococcus and the colon bacillus, methyl and crystal violet affected the colon and pyocyaneus bacilli, and Victoria and night blue were specific for Gram-positive organisms. The formation of addition products of the dye with a halid as in methyl green and iodin green greatly reduced the toxicity for all bacteria, and sulphonation destroyed it.

In the tissue experiments it was found that tissue cells were always inhibited before streptococci by the triphenylmethane dyes, while with the flavins, the dilution producing inhibition was the same for tissue and streptococci, although other bacteria required greater concentrations. With brilliant green and night blue there was evidence of specific toxicity for tissue cells, thus indicating that better clinical results might be expected from the use of flavin than brilliant green in wound dressings.

Attention is called to the fact that in every case a greater concentration of the dye was necessary to inhibit bacterial growth in the presence of serum and tissue than in plain broth, a result in variance with the claim of Browning at al. (E. S. R., 41, p. 188) that flavin is more bactericidal in the presence of serum than in plain broth. It is pointed out, however, that in the experiments here reported the tissue cells were growing under highly artificial conditions, and that in the body a greater resistance to the antiseptic is probably shown by the cells and a smaller resistance by the bacteria.

"Bipp" treatment.—Bismuth iodoform paste, E. S. W. Peatt (*Vet. Jour., 75 (1919), No. 527, pp. 163–173*).—The author presents the results of 16 cases treated with bismuth iodoform paraffin paste and compares it with the Carrel treatment. He finds that both methods give excellent results but differ in certain points.

"In respect to the type of wound for which each is suitable, Bipp can be used in any wound, whereas Carrel treatment can not, on account of the difficulty of keeping the tubes fixed in the wound, e. g., in a punctured foot; unless there is a communicating wound above the coronet, it is impossible to keep a Carrel tube in position. The same applies to wounds of very mobile parts of the body and parts difficult to bandage, e. g., the ear; it is also difficult to keep a tube in a vertical wound opening downwards, e. g., a dental fistula of the lower jaw. In all these cases Bipp is the better treatment.

"Bipp is the more suitable dressing in punctured wounds from which there is not an excess of purulent discharge, and which can be plugged, e. g., picked up nail. It is also preferable in operation wounds which it is desired to keep aseptic and in which healing by first intention is expected, especially if the wound is sutured.

"Carrel treatment, on the other hand, is more effective than Bipp in the more septic and larger types of wound with profuse purulent discharge, and in conditions which must be treated as open wounds. Here the continuous instillation of eusol rapidly cleanses the wound both by its mechanical and chemical actions. Whereas, if Bipp were used in this latter case, too frequent dressings and a large quantity of the paste would be required, and the treatment would not be economical because the area so to be dressed is extensive and the paste would rapidly be carried out of the wound in the discharge.

"In Bipp treatment fewer dressings and less attention to the wound between dressings are required. Eusol is very cheap, whereas Bipp is expensive, but more dressing materials and apparatus are necessary for Carrel treatment. Bipp gives the more rapid results in most cases."

**Observations on the chemotherapy of bacterial infections, with special reference to experimental pneumococcus infection,** C. H. Browning and R. Gulbransen (*Jour. Path. and Bact., 22 (1919), No. 3–4, pp. 265–269*).—Experimental proof is given that virulent organisms within the tissues—in the present case pneumococci introduced into the peritoneal cavity of mice—can be effectively dealt with by means of antiseptics, and that the result is obtained, not by killing the organisms through the sole agency of the antiseptic, but through some form of cooperation of the antiseptic and the tissues.

**The immunizing action of sodium chlorid against the anaphylactic injection (metatrophic therapy),** C. Richet, P. Brodin, and F. Saint-Girons (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 1, pp. 9–11*).—The authors state that, while severe anaphylactic symptoms are produced in a dog by an injection of 50 cc. of horse plasma three weeks after a sensitizing injection of the same plasma, such symptoms are entirely absent if, instead of using the pure plasma for the second injection, the same quantity of the same plasma be used after dilution with nine times its volume of an isotonic solution of sodium chlorid. If an injection of the salt solution is made before the injection of the pure plasma, the amount of salt must be greatly increased owing to the extreme rapidity of the elimination of the injected salt.

The theory is advanced that the sodium chlorid impregnates the nerve cells and immunizes them against the anaphylactic poison, and the possibility is suggested of utilizing this phenomenon for the prevention of anaphylactic shock.

**On the cultural characters of certain anaerobic bacteria isolated from war wounds,** R. S. Adamson (*Jour. Path. and Bact., 22 (1919), No. 3–4, pp. 345–400, pls. 5*).—This paper, which forms the first part of a general investigation of the bacteriology of wounds, deals solely with the cultural characteristics of strictly anaerobic bacteria isolated from wound material, garden and pasture soil, human and horse feces, and putrefying meat.

Fifteen anaerobic organisms are described, of which 13 are spore-bearing bacilli, one a bacillus without spores, and one an anaerobic diplococcus. The spore-bearing bacilli have been classified in three groups based on their cultural reactions. The first or proteolytic group consists of *Bacillus œdematis maligni*, *B. bifermentans sporogenes*, and *B. tetanoides*. The second or saccharolytic group comprises *B. œrogenes capsulatus*, *B. butyricus*, *Vibrion septique*, *B. von Hibler IX*, and Bacillus E. The third group, possessing neither proteolytic nor saccharolytic powers, consists of *B. tetanoides* (A), Bacillus L, Bacillus S, and MacIntosh's bacillus Type III (C).

In addition to detailed descriptions of these organisms, the paper includes a table of their cultural features, a list of 39 literature references, and several plates including colored representations and photo-micrographs of some of the cultures.

**Contributions to the biochemistry of pathogenic anaerobes, VI–VII,** C. G. L. Wolf (*Jour. Path. and Bact., 22 (1919), No. 3–4, pp. 270–307*).—Two papers are presented in continuation of the investigation previously noted (E. S. R., 40, p. 577).

VI. *The proteolytic action of Bacillus sporogenes (Metchnikoff) and B. welchii* (pp. 265–288).—In this paper the fermentation changes which take place in a cooked-meat medium inoculated with *B. welchii* and *B. sporogenes* are reported.

In a medium consisting solely of sterilized muscle and water both organisms grew with great rapidity, forming large quantities of gas consisting of carbon dioxid and hydrogen. The amount of gas formed per liter of medium was about the same with both organisms. With *B. sporogenes* from 70 to 75 per

cent of the gas consisted of carbon dioxid, while with *B. welchii* only about 38 per cent of the gas was carbon dioxid.

The proteolytic power of *B. sporogenes* was much greater than that of *B. welchii*. There was also a notable difference in their volatile acid production. *B. welchii*, which forms large quantities of volatile acids in carbohydrate-containing media, did not form any considerable quantity of acid with muscle tissue while *B. sporogenes* formed large quantities of acids in both media.

VII. *The biochemistry of B. proteus* (pp. 289–307).—This paper includes a review of the literature on *B. proteus* and reports of a study of the growth of several strains of the organism on different media, the results of which are summarized as follows:

"*B. proteus* grown upon various media does not exhibit any of the qualities of a putrefactive organism. It is a moderate gas former, the largest amount of gas being obtained in cultures of cooked meat. Compared with putrefactive organisms such as *B. sporogenes* and *B. histolyticus*, its proteolytic activities are not great. The two strains examined attacked lactose. The analytical result gives a lactose consumption of 6.9 gm. per liter. The volatile acid production is very small. In none of the experiments was any putrefactive smell noticeable, and no indol was produced under the most favorable circumstances for its development. *B. proteus* contains a powerful urea-splitting ferment, being capable of transforming 45 per cent of the total nitrogen of urine into ammonia."

**Some experiments dealing with the question whether lipoids can act as antigens,** Chung Yik Wang (*Jour. Path. and Bact., 22 (1919), No. 3–4, pp. 224–228*).—Lipoidal extracts of egg white, horse serum, and ox corpuscles were made by successive two-hour extractions of the material in a shaking machine with chloroform and ether alternately. The extract after drying and immediately before use was saponified with a few drops of N/10 caustic soda and finally emulsified in saline. Tests with the lipoidal extract and with an emulsion of the residue were performed with rabbits, using the complement deviation method.

Negative results as to antigenic properties were obtained with the lipoidal extracts of egg white and horse serum, and positive results with the lipoidal extract of ox-blood corpuscles. The crude residue after the extraction of lipoids in the latter case was found to be less potent in antigenic power than the extract but to retain still some of this power. The results with the different lipoidal extracts are considered by the author to be due possibly to varying degrees of stability of union of the proteins with the lipoidal elements.

**The loss of complementing power in guinea-pig serum at various temperatures,** J. W. Bigger (*Jour. Path. and Bact., 22 (1919), No. 3–4, pp. 323–344, figs. 10*).—This paper reports the results of an investigation of the rate at which guinea-pig sera, freed from clot and cells and kept in vitro at various temperatures, lose their complementing power.

At low temperatures the rate of disappearance of complement was much slower than at higher temperatures. A 75 per cent loss occurred at 50° C. in from one-half hour to one hour, at 30° in 47.5 hours, at 20° in 87 hours, at 9° in 165 hours, and at 1.5° in 920 hours. The rate of loss of complement was more rapid in the earlier than in the later stages and at temperatures between 9 and 50° appeared to be regular.

**The value of the new complement deviation method for the serodiagnosis of glanders,** O. Waldmann (*Arch. Wiss. u. Prakt. Tierheilk., 42 (1916), No. 2–3, pp. 194–222*).—A review is given of the literature on the complement deviation and conglutination methods for the diagnosis of glanders, followed by a report of results obtained by the authors in the Pathological Institute of the Veterinary

School (Berlin). The author is of the opinion that the complement deviation method is superior to others for the serological detection of the disease.

**Note on the rapid production of serum against rinderpest and its utilization in infected regions.** M. CURASSON (*Rec. Méd. Vét., 95 (1919), No. 11, pp. 323–327*).—Methods employed by the author for immunization against rinderpest are described in detail.

Animals which have recently recovered from the disease are chosen for hyperimmunization, and animals at different stages of the disease are used to furnish the virulent blood. In place of a single massive injection, two inoculations of virulent blood are employed for immunization, the first coming from an animal at the end of the first stage of the disease and the second, after an interval of 3 or 4 days, from an animal at the second or third period. Each inoculation of 3 or 4 liters is in itself sufficient to produce hyperimmunity.

The blood for immunization is drawn into a sodium citrate solution in sterile bottles. The immunizing blood is drawn four times, first on the tenth day following the second virulent injection and then at intervals of four days. From 3 to 5 liters are taken each time, the blood being received in sterile bottles containing 2 gm. of potassium oxalate and 0.25 gm. of phenol dissolved in 50 or 60 cc. of water. In place of oxalated blood, blood serum to which phenol is added in the proportion of 0.25 gm. to a liter of the serum may be employed. Both blood and serum are kept cool until used.

As a preventive measure, the oxalated blood is injected in doses of 40 cc. for adults and from 20 to 30 cc. for young animals. Virus in the form of virulent blood, kept liquid by defribination or by the addition of sodium citrate, is injected at the same time in 0.25 cc. doses. If immune serum is used in place of the oxalated blood the doses should be diminished by one-half.

As a curative measure the immune blood or serum is said to be of only limited value, acting with certainty only during the first stage of the disease.

**Swamp fever in Wyoming.—Economic importance, general characteristics, and control.** J. W. SCOTT (*Wyoming Sta. Bul. 121 (1919), pp. 91–140, figs. 36*).—This bulletin was prepared for the purpose of bringing facts relating to the nature of swamp fever, its economic importance, how it may be recognized, and how controlled to the attention of ranchmen and farmers of the State. The author calls attention to the fact that the experiments previously noted (E. S. R., 39, p. 162) have conclusively demonstrated that the disease may be transmitted by certain biting flies, a detailed report of which work will be presented in a later paper.

**Diagnosis of tuberculosis by the complement deviation method.** CHUNG YIK WANG and J. CROCKET (*Brit. Med. Jour., No. 3053 (1919), pp. 7–9*).—An improvement in the method of preparation of tubercle antigen for the diagnosis of tuberculosis by complement deviation is reported which, together with certain precautions in technique, is said to have rendered the method much more reliable as a diagnostic procedure. The nonspecific reaction which other observers have obtained is attributed by the authors to the presence of lipoids in the antigens employed and to an insufficient heating of the tested serums. To obviate these difficulties the tubercle bacilli employed as antigens in the present study were freed from lipoids by 5 extractions alternately with chloroform and ether, and the serums were heated for at least two full hours at 55° C. The final technique employed and classification of results were similar to those of the Wassermann test.

The findings of the cases investigated by this method were positive in 75 per cent of the 104 tuberculosis subjects tested, and none of the controls reacted positively to the test after differentiation of Wassermann serums from tuberculosis by a chloroform differential method devised by the authors. It is

therefore, considered justifiable to regard the test as specific, and to conclude in case of a positive reaction not only that the disease is present but that the lesion is in an active condition. A negative result, as in the Wassermann test, is considered significant though inconclusive.

**Instructions concerning the work of the Tuberculosis Eradication Division** (*U. S. Dept. Agr., Bur. Anim. Indus., 1919, pp. 20*).—This manual of instructions includes an outline of the three projects of the division—the eradication of tuberculosis from pure-bred cattle, from circumscribed areas, and from swine; brief descriptions of tuberculin testing by the subcutaneous, intradermal, ophthalmic, and combined methods, with an explanation of the nature of tuberculin; and directions for the identification of animals after testing, disinfection of stables, care of hypodermic syringes and clinical thermometers, ordering of supplies, etc. A list is included of the tuberculosis-eradication field offices and inspectors in charge of the same.

**Contribution to the study of ulcerous lymphangitis** (*Rev. Gén. Méd. Vét., 28 (1919), No. 329, pp. 233–243*).—This is the report of a series of studies on the nature of ulcerous lymphangitis and its mode of transmission, therapy, and diagnosis. Evidence is furnished that the bacillus of Preisz-Nocard is the specific cause of the disease, and that it is possible to reproduce it experimentally by local inoculation of very small doses of a young culture of the organism, associated preferably with an inert substance such as powered charcoal. The true symptoms of the disease do not appear until about a month after the virulent injection.

The therapeutic agents studied included toxins such as mallein, tuberculin, rivoltin, etc., specific vaccines, chemical substances, serums, and surgical methods. In no case were entirely satisfactory results obtained. The various methods of treatment apparently hastened the cure of light attacks, but had little effect on extended lesions.

While the injection into the conjunctival tissue of a glycerin extract of a pure culture of the bacilli of Preisz-Nocard produced a reaction in animals afflicted with the disease, such a reaction is not considered specific as an edema was also produced at the point of inoculation in healthy animals.

**Abortion disease of cattle**, W. E. Cotton (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 5, pp. 504–528*).—This paper, delivered before the veterinarians of Indiana, summarizes the present status of knowledge of contagious abortion of cattle.

**Infectious abortion and sterility in cattle**, E. T. Hallman (*Michigan Sta. Circ. 40 (1919), pp. 3–7*).—This is a popular summary of information.

**A new nematode causing parasitic gastritis in calves**, A. L. Sheather (*Agr. Research Inst. Pusa Bul. 86 (1919), pp. 5, pls. 5*).—A discussion and description of an undescribed nematode, found in immense numbers in the fourth stomach of several calves which had died showing all the symptoms associated with parasitic gastritis.

**The results of investigations of hemorrhagic septicemia in sheep in Colorado**, I. E. Newsom (*Amer. Jour. Vet. Med., 14 (1919), No. 7, pp. 371–377*).—The author gives an account of several of the 24 outbreaks of this disease investigated.

**Tick eradication laws**, R. C. Knox (*Arkansas Sta. Bul. 160 (1919), pp. 16*).—A compilation of Arkansas laws relating to tick eradication, together with the regulations of the board of control, with notes on these laws and regulations prepared by R. M. Gow.

**Parasitic diseases**, S. Hadwen (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 6, pp. 639–642, figs. 3*).—Following reference to the article on ixodic lymphan-

gitis by Jarvis, previously noted (E. S. R., 38, p. 785), the author presents data to show that ticks, particularly *Dermacentor albipictus* and possibly also *D. venustus*, play an important part in the production of fistulous withers among unbroken range horses in sections of British Columbia.

Investigations on the pathological anatomy of infectious anemia of the horse, I. KANI and K. KIKUCHI (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 3, (1917), pp. 34, pls. 6*).—This report includes a detailed account of 5 cases studied.

The etiology of an epidemic among horses (meningo-encephalitis enzootica; Borna disease), R. KRAUS, G. FISCHER, and L. KANTOR (*Rev. Inst. Bact. [Argentina], 2 (1919), No. 1, pp. 114–118, pls. 6, fig. 1*).—The authors show for the first time that Borna disease occurs in Argentina. The lesions in the brain and the cultures correspond to the descriptions given by Joest and Degen (E. S. R., 26, p. 786) and Johne.

Observations with regard to the etiology of joint-ill in foals, J. M'FADYEAN and J. T. EDWARDS (*Jour. Compar. Path. and Ther., 32 (1919), No. 1, pp. 42–71*).—In continuation of the investigations previously noted (E. S. R., 39, p. 891) the authors report upon 37 cases at some length.

The bacteria encountered in the cases described fall into four groups, namely, strepticocci, *Bacillus nephritidis equi*, *B. abortivo-equinus*, and coliform bacilli. In 20 of the 37 cases examined the indications are that streptococci was the cause of the lesions, since they were more or less abundantly present in the diseased joints, and occurred there in a state of purity or accompanied only by an inconsiderable number of other bacteria whose presence could reasonably be regarded as accidental. *B. nephritidis equi* was apparently by itself in causing the disease in four cases and was present in three others. *B. abortivo-equinus* was the cause of the disease in two of the cases. *B. coli communis*, or organisms closely resembling it, was probably the cause of the disease in four cases, and possibly in a fifth.

Studies on anthelmintics.—I, Experiments with repeated doses of oil of chenopodium, M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 4, pp. 416–423*).—Experiments are reported which were conducted with a view to determining the method in which chenopodium can be successfully employed against the hookworm in the dog and to secure further data on its anthelmintic action.

The results indicate that chenopodium in repeated doses of 5 minims daily for 12 doses is rather efficacious against ascarids, whipworms, and probably hookworms. It has no equal as a drug for the removal of ascarids, since it will in a great majority of cases remove 100 per cent of the worms present in the dog and is apparently about as effective under proper conditions of administration against ascarids of man and swine.

Studies on anthelmintics.—II, The anthelmintic and insecticidal value of carbon bisulphid against gastrointestinal parasites of the horse, M. C. HALL, M. J. SMEAD, and C. F. WOLF (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 5, pp. 543–549*).—The authors present data that lead to the conclusion that carbon bisulphid was 100 per cent effective against bots and ascarids, namely, *Gastrophilus nasalis*, *G. hæmorrhoidalis*, and *Ascaris equorum* (*A. megalocephala*). "In our experiments, it was uniformly 100 per cent effective against bots, removing all of 690 bots from the 6 infested animals, and usually 95 to 100 per cent effective against ascarids, removing (approximately) 91 of 94 worms from the 8 infested animals, or almost 97 per cent.

"Carbon bisulphid gives as good results in 1 6-dram dose as in 2 4-dram doses or 3 3-dram doses, and it is likely that the smaller sum total of drug in the one dose is to be preferred to the greater total in several doses, especially

as the gastric lesions seem less pronounced with the 1 dose. It is quite possible that further experiment will show that a single dose even smaller than 6 drams will be adequate."

**A mycosis of turkeys**, R. G. Archibald (*Jour. Compar. Path. and Ther., 31 (1918), No. 4, pp. 257–260, figs. 4*).—This report relates to a disease in a flock of young turkeys in Nyasaland. The affection, in which lumps appeared on the heads and necks and occasionally on the knee joints, had a predilection for young birds, usually attacking those between 6 days and 7 months old, with a case mortality of 75 to 85 per cent, while older birds rarely acquired the disease. Macroscopically and histopathologically the lesions showed a striking similarity to epithelioma contagiosum avium.

## RURAL ENGINEERING.

**Operation and maintenance of irrigation systems**, S. T. Harding (*New York: McGraw-Hill Book Co., Inc., 1917, pp. XII+271, pls. 12, figs. 28*).—This is a practical treatise on the operation and maintenance of irrigation systems, based on data derived from such practice in the Western States. The general features of maintenance are first discussed. The maintenance of irrigation structures is next taken up in some detail, together with the important features in the organization for operation and maintenance. Considerable space is devoted to methods of delivering irrigation water and measurement of irrigation water. Final chapters cover rules and regulations for operation and cost accounting.

**Reclaiming the arid West**, G. W. James (*New York: Dodd, Mead & Co., 1917, pp. XXII+411, pls. 48*).—This is a popular treatise on the work of the founders, organizers, and present workers of the U. S. Reclamation Service, and includes descriptions of the main reclamation projects.

**Irrigation opportunities in Russia are great**, V. V. Tchikoff (*Engin. News-Rec., 82 (1919), No. 4, pp. 190–192, fig. 1*).—The author reviews the irrigation situation in Russia, stating that the chances for both public and private enterprises are good. Cotton is the principal crop of arid Russia, and agriculture is conducted on the steppes by dry farming methods. Irrigation in Russia is confined mostly to the southern part, which is arid and semiarid. About 10,000,000 acres are irrigated in the arid region. Pumping plants are operated here and there, but more than 99 per cent of the irrigation is from gravity canals. In the semiarid regions it is stated that the proper storage of water, an increase in the use of underground water, and the use of economical irrigation methods are necessary for future success.

**Measurement of irrigation water** (*Washington: Dept. Int., U. S. Reclam. Serv., 1918, pp. 53*).—This pamphlet contains tables showing discharge through weirs and orifices and acre-feet equivalents to a given number of second feet of flow.

**Pumping for irrigation**, J. B. Marcellus (*Kans. Agr. Col. Ext. Bul. 17 (1918), pp. 16, figs. 2*).—This bulletin gives popular advice on the selection and installation of an irrigation pumping plant, based on observations from the various pumping experiments conducted in the Arkansas River Valley.

**Electrically driven high-lift centrifugal pumps supply water for irrigation**, B. P. Fleming (*Engin. News-Rec., 82 (1919), No. 2, pp. 74–79, figs. 4*).—This article describes the design and construction of a new high-lift irrigation pumping plant with steel manifold and reinforced concrete force main, and reports efficiency tests. The amount of water necessary to be supplied by pumping was estimated at 10,000 acre ft., to be supplied within a period of 50 days. A plant of 4 horizontal centrifugal units of 25 sec. ft. capacity each was selected. Each unit was attached by flexible coupling to a 350 hp., 3 phase,

60 cycle induction motor using current at 440 volts. In the tests it was found that all the units exceeded the required efficiency of 81 per cent at 90 ft. head.

"As a whole the efficiency tests of this plant illustrate the recent very remarkable advance in centrifugal pump design from the standpoint of efficiency, and give reason to believe that it is not too much to expect that in the case of large units, working under reasonably high heads, 85 per cent efficiency may be obtained where the character of the installation is such as to warrant the extra expense of a pump designed for the special conditions under which it is to operate. Such efficiency can only be obtained by the use of small running clearances in the impeller at the wearing ring, which prevent leakage from the discharge back to suction; and the water seal preventing air leakage into the suction passage around the shaft must be perfectly air-tight. Wear is to be expected in the course of time in the wearing rings, and the glands can not be maintained in perfect condition after a long period of use, so that to maintain the high efficiency found when the installation is new it will be necessary to renew from time to time the wearing rings and the bronze sleeves on the shaft."

**Transforming canal losses in terms of depth to quantity,** P. A. Cupper (*Engin. News-Rec., 81 (1918), No. 5, p. 220, fig. 1*).—Graphic data are given showing the seepage loss in irrigation canals in second feet per thousand feet length of canal for wetted perimeters from 0 to 100 ft. for a loss of 1 ft. in depth over the wetted canal area in 24 hours.

**Computing the lateral pressure of saturated earth,** A. G. Husted (*Engin. News-Rec., 81 (1918), No. 10), pp. 441, 442, figs. 2*).—The author proposes a method of computing the lateral pressure of saturated earth which is based on the usual dry earth formula but takes account of the separation of hydrostatic from earth pressure and allows full hydrostatic pressure. Thus, the vertical earth pressure is obtained by adding the total weight of earth above the plane of saturation to the net weight of earth below the plane of saturation; the lateral earth pressure is obtained by multiplying this vertical pressure by $\tan^2 (45° - \frac{1}{2} \phi_2)$ in which $\phi_2$ = the angle of repose of earth under water; and the total lateral pressure is obtained by adding the hydrostatic pressure to this lateral earth pressure.

**Inexpensive cypress lath subirrigation plan** (*Okla. Agr. Col., Ext. Div. Circ. 72 (1918), pp. 4, figs. 5*).—This circular gives brief instructions for the use of cypress lath in the construction of subirrigation laterals.

**Agricultural drainage,** T. J. Evans (*Florence, Ala.: Author, 1918, pp. 35, figs. 2*).—This pamphlet is a prospectus of a more elaborate work on the subject to be issued later. Its purpose is to secure the opinions of professional men and to interest those contemplating drainage projects.

**Synopses of drainage laws,** J. S. Smith et al. (*Columbia, Mo.: E. W. Stephens Pub. Co., 1918, pp. 365*).—This handbook contains a brief outline of the drainage laws of each of 24 States.

**Farm drainage** (*Ann. Rpt. Dept. Agr. Prince Edward Island, 1917, pp. 35–48, pls. 3*).—This report deals with the underdrainage of agricultural lands with special reference to conditions on Prince Edward Island. It is estimated that there are 200,000 acres on the island that could be profitably drained. Under average conditions it is estimated that drainage costs about $30 per acre. Features of drain construction are discussed.

**Use of dynamite in antimalarial drainage operations,** J. K. Hoskins and W. E. Hardenburg (*Pub. Health Rpts. [U. S.], 33 (1918), No. 47, pp. 2052, 2053*).—It was found that in antimalarial drainage work with dynamite the best results were obtained in mucky areas where the mud was so deep and soft that hand excavation became slow and difficult.

An analysis of the costs of two adjacent ditches in a large swamp, one excavated with dynamite and the other with hand labor, is given. The yardage of the dynamited ditch was 4,151 and of the hand dug ditch 1,956. The cost per cubic yard of the dynamited ditch was 39 cts. as against 45 cts. per cubic yard for the hand dug ditch. The method of using the dynamite is described.

**Segment blocks have advantages on larger size drains**, D. L. YARNELL (*Engin. News-Rec., 82 (1919), No. 14, pp. 663, 664*).—An investigation of the use of segment block for large size drains, made by the Bureau of Public Roads of the U. S. Department of Agriculture is reported from which it is concluded that owing to their cost, lightness, and convenience of handling, and structural advantages over tile their use for large size drains should increase.

**Progressive erosion in a dredged drainage channel**, C. E. RAMSER (*Engin. News-Rec., 82 (1919), No. 18, pp. 876, 877, figs. 6*).—Observations on enlargement and effect on capacity due to erosion in the North Fork Deer River drainage channel, made by the Office of Public Roads of the U. S. Department of Agriculture, are reported. Measurements of six cross sections of a portion of the channel constructed in May, 1915, were made along a course of 700 ft. in April, 1916, and in January, 1917. A comparison of the plotted cross section showed that after a certain amount of erosion had taken place in the channel erosion did not tend to increase the irregularity of the channel.

"Between April, 1916, and January, 1917, the average cross-sectional area of the channel increased from 331 to 409 sq. ft. The values of $n$ in Kutter's formula obtained for high stage during the years of 1916 and 1917 were 0.0271 and 0.267, respectively, from which it is seen that the roughness coefficient was practically the same before and after the erosion occurred."

"The mean velocities in the channel were about 4.5 ft. per second, and the discharge capacities for 1916 and 1917 were 1,473 and 1,881 sec.-ft., which represents an increase of 27.7 per cent for the period from April, 1916, to January, 1917. The increase in cross-sectional area was 23.5 per cent, which is less than the percentage of increase in capacity."

It is noted that in the design of this channel no provision was made for a run-off rate to give satisfactory drainage at the beginning, the probable effect of erosion being foreseen and a considerable financial saving being effected thereby.

**Inspection of drainage ditch cross-sections after contract dredging**, E. S. BLAINE (*Engin. News-Rec., 82 (1919), No. 21, pp. 1019–1022, figs. 7*).—This article describes and explains the development of methods for examination of cross sections of drainage ditches after contract dredging. Soundings at first made by level rod gave way to lead and line following along a tape, the boat in use by the sounding man being pulled across the ditch by means of the tape.

**The water supply of Egypt, 1913–14**, B. F. E. KEELING (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 370–380, figs. 5*).—The hydrography of the Nile and methods of water supply for irrigation are discussed and attention drawn to the abnormal dearth of water during 1913–14. Data are submitted to show that under such conditions the rice crop must be sacrificed in favor of the cotton crop.

**Drinking water** (*Rpt. Min. Agr. Prov. Quebec, 1917, pp. 100–102*).—Sanitary analyses of 13 samples of water from domestic drinking supplies are reported and briefly discussed. Eleven of the samples were found to be contaminated and one was considered doubtful. Details on the bacterial flora of three of the samples are reported, from which it is concluded that "such waters could only disseminate disease and multiply the consumer's liabilities."

**Water purification**, J. W. ELLMS (*New York: McGraw-Hill Book Co., Inc., 1917, pp. X+485, pls. 6, figs. 168*).—It is the purpose of this book to provide the

reader with as nearly as possible a complete account of the development of the art of water purification. Consideration is first given to the physical, chemical, and biological properties and characteristics of various classes of water. The relation of polluted public water supplies to water-borne diseases is given special attention. The various steps in purification processes such as plain sedimentation, coagulation, filtration, and disinfection are described in considerable detail. Special chapters are devoted to water softening and to the removal of iron and manganese from ground water supplies.

**Water systems for farm homes**, F. C. FENTON (*Univ. Missouri, Agr. Ext. Serv. Circ. 49 (1918), pp. 16, figs. 13*).—This is a brief popular bulletin on the subject, prepared with special reference to Missouri conditions. In addition to the pneumatic system of water supply the so-called autopneumatic system, the value of which has been much under discussion, is described as having been in actual operation and having been found practical. It is stated, however, that "many such systems have been in operation for years and are giving excellent satisfaction, while others have given considerable trouble. Taking everything into consideration, it can not be considered as reliable as some of the other systems."

**The relation of the shrinkage and strength properties of wood to its specific gravity**, J. A. NEWLIN and T. R. C. WILSON (*U. S. Dept. Agr. Bul. 676 (1919), pp. 35, pls. 5, figs. 16*).—This bulletin reports data on the relations of the strength properties of woods to their specific gravity in such form as to render them easily useful (1) for estimating the properties of any particular timber, (2) for selecting timber for any given purpose, (3) for comparing the various species, and (4) for determining to what uses different species are best adapted.

Analyses of over 200,000 tests, made at the Forest Products Laboratory at Madison, Wis., indicated a fairly constant relation between specific gravity and strength.

It was found in plotting the strength values in different tests to a natural scale that in practically every case a curve was formed corresponding to the general equation $f=p\ G^n$, in which $f$ is the strength value, G the specific gravity, and $p$ and $n$ are constants. Curves, equations, and data are given for shrinkage, static bending, impact bending, compression, hardness, shearing, and tension for both green and air-dry wood.

The table on the opposite page gives equations for shrinkage and for each of the strength properties of green and dry wood in terms of specific gravity.

"In comparing different timbers or species, in estimating their various properties, and in finding species with exceptional strength in some properties which may render them valuable for special uses, a knowledge of the specific gravity strength relations is a valuable aid. . . . Such equations can never take the place of tests of species whose properties are unknown. If any particular mechanical property is known, the specific gravity may be approximated and the other properties estimated; even the properties of woods upon which no test data are available can be estimated with a fair degree of accuracy from the results of specific gravity determinations. Nevertheless, it is apparent from a study of the table and diagrams that no one kind of test can replace a complete series of tests."

**Wear-resisting values of various aggregates for concrete roads indicated**, H. S. MATTIMORE (*Engin. News-Rec., 80 (1918), No. 18, pp. 861–863, figs. 12*).—An impact testing machine designed to measure the resistance to impact of different materials and mixes entering into the construction of concrete roads is described and illustrated, and tests conducted by the New York State Highway Commission on the impact resistance of several hundred different aggregates and mixes are summarized.

*Equations for shrinkage and for each of the strength properties of green and air-dry wood in terms of specific gravity.*

| Condition of wood. | Shrinkage from green to oven-dry condition. | *Per cent of dimensions when green.* | Static bending. | | | | | | Impact bending, 50-pound hammer. | | | Compression parallel to grain. | | | Hardness: Load required to embed a 0.444-inch ball one-half its diameter. | | | Shear. | | Cleavage. | | Tension. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Green | In volume. | S=28 G 1. | F=19000 $\sqrt[4]{G^6}$. | *Lbs. per sq. in.* | Fiber stress at elastic limit. | M=26200 $\sqrt[4]{G^6}$. | *Lbs. per sq. in.* | Modulus of rupture. | F=33000 $\sqrt[4]{G^6}$. | *Lbs. per sq. in.* | Fiber stress at elastic limit. | F=11000 $\sqrt{G^6}$. | *Lbs. per sq. in.* | Fiber stress at elastic limit. | H=480 $\sqrt[4]{G^9}$. | *Lbs.* | End surface. | S=363 $\sqrt{G^4}$. | *Lbs. per sq. in.* | Surface of failure radial. | C=1100 G 2. | *Lbs.* | Surface of failure radial. | T=2100 G 2. | *Lbs. per sq. in.* | Surface of failure tangential. |
| Green to oven-dry | Radial. | S=9.5 G 1. | E=3000 G 1. | *1,000s of lbs. per sq. in.* | Modulus of elasticity. | E=2500 G 1. | *1,000s of lbs. per sq. in.* | Modulus of elasticity. | E=3550 G 1. | *1,000s of lbs. per sq. in.* | Modulus of elasticity. | E=3500 G 1. | *1,000s of lbs. per sq. in.* | Modulus of elasticity. | H=380 $\sqrt{G^9}$. | *Lbs.* | Tangential surface. | S=275 $\sqrt{G^4}$. | *Lbs. per sq. in.* | Surface of failure radial. | C=1070 G 2. | *Lbs.* | Surface of failure radial. | T=1950 G 2. | *Lbs. per sq. in.* | Surface of failure tangential. |
| Air-dry | Tangential. | S=17.0 G 1. | W=9.0 G 2. | *Inch lbs. per cu. in.* | Work to elastic limit. | W=3.51 G 2. | *Inch lbs. per cu. in.* | Work to elastic limit. | W=25 G 2. | *Inch lbs. per cu. in.* | Work to elastic limit. | C=1200 G 1. | *Lbs. per sq. in.* | Maximum crushing strength. | H=111 G 2. | *Inches.* | Height of drop causing complete failure. | W=148.0 G 3. | *Inch lbs. per cu. in.* | Total work. | W=38.9 G 2. | *Inch lbs. per cu. in.* | Work to maximum load. | W=148.0 G 3. | *Inch lbs. per cu. in.* | Total work. |
| | | | | | | | | | | | | | | | | | | | | | C=1300 G 2. | *Lbs.* | Surface of failure tangential. | T=2100 G 2. | *Lbs. per sq. in.* | Surface of failure tangential. |
| | | | | | | | | | | | | | | | | | | | | | | | | T=2100 G 2. | *Lbs. per sq. in.* | Surface of failure tangential. |

It is concluded that "(1) crushed stone remains intact and resists impact better than gravel. (2) Large size stone and gravel are more durable than the small sizes. (3) The resistance to impact depends upon the quality of both the mortar and the coarse aggregate and, although a good matrix has a tendency to support a weak coarse aggregate, the use of a good quality of the latter will make a more durable pavement. (4) A coarse-grained sand mortar resists impact better than a mortar made with finer-grained sand. (5) No relation has been observed between compressive strength and resistance to impact. . . . An increase of cement content increases resistance to wear, but with a proper selection of aggregates of excellent quality a 1:2:4 mix can be made which will offer a better resistance to impact than a poorer quality of aggregate mixed 1:1.5:3."

**Effect of tractive resistance in terms of gasoline consumption** (*Engin. and Contract., 51 (1919), No. 19, p. 482, figs. 3*).—Three charts are given showing the relation between tractive resistance of road surface, annual cost of roadbed, and grade on gasoline consumption for motor vehicles.

**An economic study of the gas tractor in Pennsylvania**, D. S. Fox (*Pennsylvania Sta. Bul. 158 (1919), pp. 3–20, figs. 5*).—This bulletin reports data derived from detailed records secured from 54 farms in central and southeastern Pennsylvania, on which gas tractors were operated during the year ended in the spring of 1918. Tractors were used chiefly on the larger farms, 123 acres of crops per farm being the average. The average purchase price was $959, and the average estimated life of the tractor was 8.1 years. Kerosene at 12 cts. per gallon was a cheaper fuel than gasoline at 25 cts. The cost per 10-hour day was $2.06 for kerosene and $3.32 for gasoline, and per horsepower hour 2.2 and 3.1 cts., respectively.

The average tractor did 50.6 days' work. There was an average of 12.8 days of plowing, 9.3 days of harrowing, and 19.6 days of belt work. The average tractor used a little over 1 gal. of cylinder oil worth 45 cts. for each 10-hour day. The average cost of operation including operator's labor was $622.12 for 50.6 days, or an average of $12.30 per day. The cost excluding the operator's labor was $495.62, or $9.80 per day. The size of farm was increased in only two cases, and more intensive crops were grown on only 7 farms of the 52 that were operated before the purchase of the tractor.

The most important factor affecting the cost of operation was days of work done per tractor. Tractors working 30 days or less, or an average of 24.3 days, cost $19.97 per day, while tractors working over 70 days, or an average of 84.9 days, cost only $9.85 per day. In the second case the overhead cost was distributed over more days of work.

The average tractor cost of plowing was $2.33 per acre. The plow cost was 71 cts. per acre, making a total of $3.04. The tractor cost for harrowing and disking was 69 cts. per acre for once over the ground, and excluding the cost of tillage implements used.

The farmer's son was the most efficient operator. The average cost per day was as follows: Son $10.75, owner $12.16, and hired man $12.82. An average of 1.8 horses were disposed of on 48 farms. The cost of operation, less the operating labor, was $275.34 for each horse displaced.

There was a change in layout on only two farms. The fields on most farms, however, should be rearranged for efficient tractor operation.

**Tractor test on the university farm**, J. A. Howenstine (*Agr. Student, 24 (1918), No. 9, pp. 542, 543, fig. 1*).—A test was conducted on a 12–20 h. p. tractor plowing 8 in. deep on heavy black clay soil at the Ohio State University. Kerosene was used for fuel, gasoline being required only for starting and priming. A three-bottom gang plow and a harrow were used. The average speed was

1.66 miles per hour, and 0.401 acres were plowed per hour. The fuel consumption per acre was 3.71 gal. of kerosene, and the cost per acre plowed and harrowed was 70.9 cts.

**Demonstrations of tractors and plows** (*Trans. Highland and Agr. Soc. Scot., 5. ser., 30 (1918), pp. 295–358, figs. 29*).—This is a report of tests of 29 different tractors with a number of types of plow on stubble and grass land, consisting in one case of a deep free loam with occasional earth-fast stones and in another of a free loam overlying a clay subsoil. The stiffest grade encountered was 1 in 5.2. Of the 29 machines which took part in the demonstration 15 ran on four wheels, 6 on three wheels, 4 on caterpillar tracks, and 4 were single unit machines. Twenty-five machines were driven by paraffin, 3 by petrol, and 1 by steam. The weights varied from less than 3,000 lbs. to over 8,000 lbs. The depth of plowing required varied at the different points from 6 to 8 in. for grass land and from 7 to 9 in. for stubble. The general conclusions derived from the results of this test are as follows:

The weight of the tractor should not exceed 3,000 lbs., and the horsepower should not be less than 20-brake horsepower. Caterpillar tracks did not show any advantage in gripping power over the best type of wheels. Well designed spuds appeared preferable to either spikes or bars on wheels. Exposed gear drives on wheel tractors and excessive wear on caterpillar tracks tended to impair durability. Spring attachments between tractor and plow, with a release device in case of severe shocks, appeared desirable. It was found that the point of attachment should be variable vertically and horizontally. Speeds of 2½ and 4 miles per hour forward, with reverse, appeared to be most generally useful. Complete vaporization of paraffin was not generally obtained, and it is thought probable that the use of petrol will be more satisfactory under normal conditions. Handling and turning did not usually prove difficult. Single unit machines had the advantage that the implement operated was directly under the observation of the driver. Lighter tractors and single unit machines occupied less time and space in turning. It was found that plows must be adjustable to varying widths as well as to varying depths. Where the tractor and plow were separate an automatic lift was found desirable. A guide wheel to regulate width of leading furrow was also found desirable. It is concluded further that under the conditions of the test the price of a tractor should not exceed £300 (less than $1,500).

**Homemade header attachment**, F. E. Fuller (*Mont. Col. Agr. Ext. Serv. [Pub.], No. 27 (1918), pp. 4, figs. 2*).—A homemade header attachment for the ordinary binder is briefly described and illustrated.

**Potato planting machinery in New York**, E. V. Hardenburg (*Cornell Countryman, 16 (1919), No. 2, pp. 75, 76, fig. 1*).—It is stated that approximately 75 per cent of the acreage in the four principal potato areas of New York is planted by machine planters.

A study of comparative costs of machine and hand planting on 360 potato farms showed that machine planting was more economical on farms producing 5 acres or more of potatoes. A study on 635 farms of the potato yields obtained from the use of one and two-man planters showed, with one exception, that the yields per acre were higher where two-man planters were used.

**Farm mechanics**, H. A. Shearer (*Chicago: Frederick J. Drake & Co., 1918, pp. 250, figs. 239*).—This is a popular treatise on machinery and its use in the saving of labor on the farm, and includes sections on tools, shopwork, driving and driven machines, farm waterworks, and sewage disposal, and care and repair of farm implements. It is obvious that considerable of the information has been compiled from somewhat out-of-date publications.

**The farmer his own builder**, H. A. ROBERTS (*Philadelphia: David McKay, 1918, pp. 302, pls. 11, figs. 171*).—This is a popular reference book describing methods and presenting suggestions, details, formulas, and rules for estimating labor and materials for the construction of dwellings, barns, and other farm buildings, together with their accessories, with special reference to concrete and carpentry.

**The homemade stave silo**, L. S. CORBETT and E. W. MORTON (*Univ. Maine Ext. Bul. 118 (1918), pp. 13, pl. 1*).—This bulletin discusses silo construction with special reference to Maine conditions, and describes and illustrates a type which it is stated may be constructed in the State with farm labor and at low cost.

**Pit silos for New Mexico**, J. E. WATT (*N. Mex. Col. Agr., Ext. Serv. Circ. 30 (1918), pp. 16, figs. 8*).—General information on the construction and cost of pit silos is given with special reference to New Mexico conditions.

**The silo**, F. W. IVES (*Agr. Col. Ext. Bul. [Ohio State Univ.], 14 (1918–19), No. 4, pp. 24, figs. 22*).—This bulletin gives general information on the construction and cost of silos with special reference to Ohio conditions.

**A silo for every farm**, E. L. WESTOVER (*Oreg. Agr. Col., Ext. Bul. 297 (1918), pp. 15, figs. 16*).—This bulletin gives general information on silo construction with special reference to Oregon conditions, and describes and illustrates the wooden-hoop and re-saw types of silo. It is stated that either type should not cost more than $1.50 per ton capacity in the State.

**Suggestions for selecting and building a silo**, S. I. BECHDEL (*Penn. State Col. Ext. Circ. 72 (1918), pp. 32, figs. 21*).—General information on silo construction is given with special reference to Pennsylvania conditions.

**Silos: Types, relative costs, ensilage crops, machinery for ensilage crops, silage facts and factors** (*Wyo. Farm. Bul., 8 (1919), No. 10–12, pp. 32, figs. 24*).—This bulletin deals with silos and their construction with special reference to Wyoming conditions, and gives information regarding silage cutting, silo filling, etc.

**How to cure hams, bacons, and other pork products**, L. FOOT (*Col. Agr. Univ. Ark., Ext. Circ. 52 (1918), pp. 40, figs. 12*).—This is a handbook of instructions for ice plants, cold storage, meat markets, and other plants having refrigerating facilities.

**Bill of materials and building plans for the Clemson sweet potato storage house**, G. P. HOFFMANN and G. E. PRINCE (*Clemson Agr. Col. S. C., Ext. Circs. 10–11 (1918), pp. 2 each, pl. 1*).—Detailed drawings, specifications, and a bill of materials for sweet-potato storage houses of approximate capacities of 1,000 and 2,000 bu. are given.

**The self-feeder for pork production**, L. R. HIGHFILL (*Univ. Fla. Div. Agr. Ext. Bul. 20 (1919), pp. 8, figs. 7*).—This bulletin describes and illustrates self-feeders for hogs. These consist mainly of a hopper for holding the feed, below which is a trough into which the feed flows from an adjustable opening.

**The farm poultry house**, C. E. SEITZ and N. E. B. TALCOTT (*Va. Polytech. Inst. Ext. Bul. 37 (1918), pp. 14, pls. 3, figs. 10*).—This bulletin enumerates the essential features of poultry house construction with special reference to Virginia conditions, and describes and illustrates the combination roof poultry house, the shed roof poultry house, and the colony house.

**Housing farm help**, R. S. WHITING (*Nat. Lumber Manfrs. Assoc. [Pub.], Gen. Ser. No. 76 (1918), pp. 24, figs. 23*).—This pamphlet describes and illustrates and gives plans of farm dwelling houses. It is based largely on work done by the agricultural engineering divisions of the State colleges and the Rural Engineering Division of the U. S. Department of Agriculture.

**Farm sewage disposal for Idaho conditions**, J. C. Wooley (*Univ. Idaho Ext. Bul. 20 (1918), pp. 12, figs. 10*).—This is a very brief description of the construction of sewage disposal systems which presumably are considered adequate to meet all rural conditions in the State of Idaho.

**A portable privy for use in field service**, T. H. D. Griffitts (*Pub. Health Rpts. [U. S.], 33 (1918), No. 30, pp. 1225, 1226, pls. 2*).—A portable privy is described and illustrated which is designed for the use of laborers employed at work and required to move from place to place.

**Electricity on the farm**, M. Creese (*Md. Col. Agr. Ext. Serv. Bul. 9 (1917), pp. 145–176, figs. 22*).—The purpose of this bulletin is to show the possibilities of the use of electricity on the average Maryland farm and to illustrate the applications of electricity for light and power. Lighting plans for the farm house and barn are also given.

## RURAL ECONOMICS.

**The place of agriculture in reconstruction**, J. B. Morman (*New York: E. P. Dutton & Co., 1919, pp. IX+374*).—Soldier land settlement policies of ancient Rome and the encouragement given to the matter by Great Britain, France, and Canada are the subjects of earlier chapters. Sources of information for analysis of the latter situations are respectively the program of the British Labor Party and the British Government plan of small holdings and profit-sharing as administered by the Board of Agriculture and Fisheries; the text of the French law of April 9, 1918, and subsequent decrees and a pamphlet of instructions concerning it; and the provisions of the Canadian Land Settlement Act and the plan for vocational training under direction of the Department of Soldiers' Civil Reestablishment.

The policy of the Secretary of Interior, land settlement acts proposed for the United States, and propositions by farmers' organizations are described in detail. The author urges a national policy of agriculture and land settlement for the United States which shall provide for the employment of returned soldiers, insure production on the unused acres in order to meet the needs of the entire Nation, furnish mortgage and personal credit, facilitate land purchase, and train farm laborers.

**The land and the soldier**, F. C. Howe (*New York: Charles Scribner's Sons, 1919, pp. XI+196*).—The principles of Government promotion of farm colonies and its practicability, as illustrated by the Durham State Land Settlement in California and by similar projects in foreign countries, Australia, Denmark, Ireland, Germany, and Russia, are discussed. The author points out what he considers to be the advantages of such socialized farming in establishing returned soldiers, spreading efficient agricultural practice, and offering remedies for the evils of usury, land monopoly, and farm tenancy. He sets forth in detail matters of selection of sites, plans of the communities, and means of financing and securing credit to the colonists.

**Information regarding progress under the Land Settlement Act of the State of California and about the plans for soldier settlement in the future** (*Sacramento: State Land Settlement Bd., 1919, pp. 43, figs. 12*).—This gives a detailed description of the Durham State land settlement from the passage of the State Land Settlement Act, and of progress up to May 30, 1919. See also a previous note (E. S. R., 40, p. 591.)

**The place of agriculture in modern industrial society, I–II**, E. G. Nourse (*Jour. Polit. Econ., 27 (1919), Nos. 6, pp. 466–497; 7, pp. 561–577*).—From a discussion of two philosophies, termed the extravagantly agrarian and the strictly mercantilist, the author approaches the theory of the conciliation of agriculture

and industrialism demanded by their mutual interdependence in modern society. He shows in turn that France has been compelled to adopt a harmonious adjustment of her agriculture and commerce; that England has pursued a commercial policy involving the sacrifice of her agriculture; and that Germany has followed the course of State intervention to insure a balance between agriculture and industry for military expediency. He claims that the tendency in the United States has been to avoid any conscious policy, with the result that agriculture was approaching a position subservient to industry at the beginning of the war, and he advocates stabilizing our agriculture by guarantying to it equal favor with industry in education, capital, and organization.

**Food production in the United Kingdom** (*War Cabinet* [*Gt. Brit.*] *Rpt. 1917, pp. 156–165*).—This chapter contains the report of the British War Cabinet as regards increased agricultural production, and the main problems that confronted the Boards of Agriculture in carrying out the program for production.

**Food production and its problems for the consumer** (*Min. Reconstr.* [*Gt. Brit.*], *Reconstr. Prob.* [*No.*] *14* (*1919*), *pp. 22*).—Statistics are given to show that the number of the population fed from products of the soil of the United Kingdom has been growing continually smaller since the first complete census in 1801. The fact that a smaller number of persons is fed from the cultivated land of the United Kingdom than from that of Germany is explained by the greater proportion of land under grass in the United Kingdom. The author maintains that, if the home-grown food supply is to be increased, the farmer must be assured of a settled policy in regard to education, credit, and insurance against the risks incurred in arable farming.

**Rural industries** (*Min. Reconstr.* [*Gt. Brit.*], *Reconstr. Prob.* [*No.*] *13* (*1919*), *pp. 13*).—Certain trades are described as rural industries and as means of providing alternative occupations and increased income for agriculturists. Assistance for this development through propagandist societies and a certain amount of State aid is recommended for Great Britain.

**Rural economy of France,** H. M. Conacher (*Scot. Jour. Agr., 1* (*1918*), *No. 4, pp. 442–450; 2* (*1919*), *Nos. 1, pp. 49–59; 2, pp. 203–212*).—This article relates to the conditions of the rural economy of France in the nineteenth century and the effects of the French Revolution upon agricultural practices, this information being derived mainly from the Rural Economy of France since 1789, by De Lavergne. It reviews, also, characteristics of the later agriculture, especially of the systems of landholding by various departments, as exhibited in La Petite Propriété Rurale en France, previously noted (E. S. R., 22, p. 395), and the land tenure and principal agricultural industries of the Seine-Marne Basin.

**[German agriculture after the war],** Stieger (*Jahrb. Deut. Landw. Gesell., 31* (*1916*), *pp. 134–149*).—Discussing methods of increasing the supply of agricultural labor in Germany, the author advocates piecework for the permanent workers; utilization by industrialized farms during the busy seasons of the labor bands of transients leaving their own small holdings in search of temporary labor, also of children of school age when not in attendance at school, and of students, teachers, and artisans when on vacation; the adaptation of now useless war machinery for use in agriculture; and other remedies.

**A practical scheme of agricultural organization and rural reconstruction in Bengal,** G. S. Dutt (*Bengal, Bihar, and Orissa Coop. Jour., 4* (*1919*), *No. 6, pp. 440–459*).—This contains extracts from an address in which branch agricultural associations of the agricultural association of the district of Birbhum in the Province of Bengal are described as propagandist and organizing bodies for the purchase and dissemination of seeds and fertilizers, for supplying credit to members, and for advancing practical agricultural education. The

author urges support for the cooperative movement and a central organization for these associations along the plan of central agricultural societies in Japan and Denmark.

**The consolidation of agricultural holdings in the United Provinces**, H. S. JEVONS (*Agr. Jour. India, 13 (1918), No. 2, pp. 222–230; 14 (1919), Nos. 1, pp. 49–64; 2, pp. 331–349, pl. 1, figs. 2*).—The author outlines the necessity of a regrouping of the land holdings in India to increase the supply of agricultural products. He maintains that there should be established demonstrations of improved agricultural methods to be continued for a period of years, and that the increased taxation which this involves would be more than justified by the increase of agricultural products and the resulting permanently higher standard of living. He discusses the custom of cultivating scattered holdings as a stage of the evolution of primitive society; describes the enclosure movement in England; and then sketches the advantages and procedure in developing in India a new type of rural village, enlarging and consolidating holdings, providing for surplus population, replanning of roads, and the cost of reorganization.

**Organization of the village**, D. NEWTON (*Jour. Bd. Agr. [London], 26 (1919), No. 3, pp. 247–254*).—In a résumé of a paper read before the Agricultural Club, the author reviews provisions in the Land Settlement (Facilities) Bill for advancement of communal life in the villages, discusses critically some proposals of the Agricultural Policy Subcommittee for rural development and village organization, and outlines alternative proposals as to methods of procedure and essential and desirable requirements.

**Function of the departmental agricultural labor bureaus**, A. DUMONT (*Vie Agr. et Rurale, 9 (1919), No. 12, pp. 211, 212*).—The purpose, constitution, resources, functions, and sources of the labor supply handled by the departmental agricultural labor bureau in France are briefly described.

**Cooperative credit operations under the Rural Credits Act**, E. A. WEIR (*Agr. Gaz. Canada, 6 (1919), No. 1, pp. 43–46*).—A report of money loaned and for what purpose, methods, and achievements up to November 1, 1918, of ten societies in Manitoba.

**Cooperation in agriculture in Italy**, A. TARLI (*L'Egypte Contemporaine, 10 (1919), No. 46, pp. 349–373*).—The People's Banks of Italy, on the general plan of the Schulze-Delitzsch banks of Germany, and the cooperative savings banks of rural districts, are described in detail to show the growth and importance of cooperation in Italy. Other societies included in the discussion as being evolved out of requirements of agriculturists are establishments for manufacture of chemical fertilizers and societies, limited or not, for collective farming, buying and selling, hiring machinery, insuring live stock, etc. A brief summary is given of Italian legislation favoring cooperation.

**Report of the Irish Agricultural Organization Society, Ltd.** (*Rpt. Irish Agr. Organ. Soc., 1918, pp. 115*).—This report is based on the work of 677 societies for the year ended March 31, 1918, the statistics appended continuing information previously noted (E. S. R., 39. p. 796).

**The farmer and the patent system**, E. J. PRINDLE (*Sci. Amer., 80 (1899), No. 11, pp. 162, 163; also in 121 (1919), No. 2, pp. 36, 48*).—This is an estimate of the benefit to the farmer of the patent system and the encouragement and protection of invention.

**The Japanese farmers in California** (*San Francisco: Japanese Agr. Assoc., [1919], pp. 32, pls. 5*).—A collection of reprints, chiefly from San Francisco newspapers, and of extracts by officials of Japanese organizations giving popular information as to agricultural achievements and war activities of Japanese in America.

The woman on the farm, H. C. BULLOCK (*Syracuse: Syracuse Univ., 1917, pp. 26*).—A bibliography of books and magazine articles in Syracuse, N. Y., libraries covering the social condition of the farm woman, women as farmers, women on ranches, and aids for farm women.

Wealth for the woman farmer, C. ARNOULD (*Fortune de la Fermière. Paris: Libr. Delagrave, 1918, pp. 213, figs. 56*).—A handbook of methods in certain dairying, live stock, and gardening industries.

Regulations of the Secretary of Agriculture under section 5 of the United States Cotton Futures Act as amended March 4, 1919 (*U. S. Dept. Agr., Off. Sec. Circ. 137 (1919), pp. 26*).—This supplements information previously noted (E. S. R., 35, p. 693), by giving the text of 12 regulations under section 5 of the act as amended March 4, 1919.

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul., 6 (1919), No. 27, pp. 24*).—This contains the usual list of products which farmers have for sale and brief notes by W. R. Camp on Low Price Soy Beans for Soil Improvement, and Market Prospects; and by C. S. Jones on Pure-bred Live Stock for Sale.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 5 (1919), No. 7, pp. 61–72*).—In this number are included the usual estimates of crop conditions July 1, 1919, with comparisons, estimated farm value of important products June 15, average prices received by producers of the United States, and range of prices of agricultural products at important markets, also the United States crop summary for July 1. Special commercial reports for July, 1919, on peaches and pears, and a regional apple crop report, cotton report for July, and a Florida and California crop report are made. Other items noted relate to sugar cane acreage; cotton and cottonseed prices to producers; acreage and production of truck crops in 1918 and 1919, United States; Sea Island and Egyptian cotton acreage and forecast; acreage and production, 1919, of beans, hops, broom corn, and Kafir corn; tobacco estimates by types and districts; sugar beet acreage planted, 1919; and honey yields and prospects.

Price Current-Grain Reporter Year Book 1919, E. G. OSMAN (*Price Current-Grain Rptr. Year Book 1919, pp. 112*).—This number continues information previously noted (E. S. R., 40, p. 294) by adding statistics for the year ended May 1, 1919.

[Agricultural statistics of the United States] (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Statis. Abs. U. S., 39 (1916), pp. 127–168; 40 (1917), pp. 129–170; 41 (1918), pp. 139–183*).—Data previously noted (E. S. R., 36, p. 594) are continued for the later years.

[Agriculture in Guatemala] (*Mem. Sec. Fomento [Guatemala], 1916, pp. 4–8*).—A brief report of the production of grains, live stock, and fruits in 1916 for Guatemala and its departments or counties.

Observations on agriculture in Hawaii, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 12 (1919), No. 1, pp. 8–30, pls. 6*).—This article describes some methods of cultivation, climatic and other conditions affecting agriculture, and the production and export trade from Hawaii of sugar cane, pineapple, coffee, and rubber.

Agricultural statistics of Ireland (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis., 1916, pp. 111*).—This report continues data previously noted (E. S. R., 38, p. 295).

[Agricultural industry of Holland] (*Rpt. Rotterdam Chamber Com. 1918, pp. 146–214*).—In these pages of an abridged translation of a report of the Rotterdam Chamber of Commerce for the year 1918 is given an account, with current and comparative figures, of imports into Holland of merchandise, principally

grain and other foodstuffs and textiles; also of the home trade in vegetables and other agricultural products.

**Agricultural statistics of Portugal** (*Estatis. Agr. Portugal, 1916, pp. 170*).—Data relating to the production and stocks of the principal crops and of olive oil are given for the year 1916.

**Agricultural returns for the crop year 1915–16** (*Dir. Geral Estatis., Repartiçao Estatis. Agr. [Portugal], Ano Colheita 1915–16, pp. 74*).—This gives the area sown, returns of principal crops, comparisons of the respective areas sown to crops, seed sown per acre, and other comparative figures for the agriculture of Portugal; also a summary of crop statistics for foreign countries.

**Agriculture [in Algeria]**, Jonnart (In *Exposé de la Situation Générale de l'Algérie en 1918. Algiers: Govt., 1919, pp. 392–398, 446–457*).—These pages report returns of a few principal crops in recent years, status of agricultural organizations for encouragement of agriculture, and the expenditure for and accomplishments in the way of colonization.

**Study of some Egyptian farms**, Barios (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 13, pp. 417–427; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 8, pp. 982–984; Agr. Gaz. Canada, 6 (1919), No. 1, p. 109*).—The author described before the Academy of Agriculture of France, April 10, 1919, five capitalist farms in Egypt in order to point out the advantages of investment of French capital in colonial agricultural enterprises. Data are derived from official reports of stock companies, the minister of public works, and other official administrators of these farms.

**[Agriculture in Japan]**, S. Sato (*Japan Year Book, 1917, pp. 522–541; 1918, pp. 522–541*).—Information previously noted (E. S. R., 36, p. 690) is continued for the later years.

**[Agricultural statistics of Australia]**, G. H. Knibbs (*Off. Year Book Aust., 11 (1901–1917), pp. 248–409*).—These pages continue information previously noted (E. S. R., 39, p. 192).

**Production [in New Zealand]** (*Statis. Dominion New Zeal., 3 (1917), pp. 1–120*).—Data previously noted (E. S. R., 39, p. 690) are continued for 1917.

## AGRICULTURAL EDUCATION.

**The education (Scotland) act, 1918, in relation to agriculture** (*Scot. Jour. Agr., 2 (1919), No. 1, pp. 37–41*).—The provisions of this act most vitally affecting agriculture are those limiting the conditions of part-time employment of children of school age, and those requiring boys and girls between 15 and 18 years of age to attend continuation classes.

The scheme makes full provision for those practically concerned with agriculture to take part in its administration, either as members of education authorities and school management committees, or as members of the proposed advisory industrial committees. This is expected to insure that the schemes of instruction will meet the requirements of the various districts of the country, both in their scope and in the arrangement of times and seasons.

The number of boys and girls under 18 engaged in agricultural work in normal times is estimated at one-sixth of the whole number of persons so engaged. The period of attendance at classes is to be not less than 320 hours.

**Eighteenth annual general report of the Department of Agriculture and Technical Instruction for Ireland, 1917–18** (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 18 (1917–18), pp. VI+250*).—This is the usual annual report of the department's administration and funds and details of operations during the year 1917–18, including agricultural and technical instruction.

**Agricultural yearbook for 1919,** edited by H. M. KNUDSEN (*Landökonom. Aarbog [Copenhagen], 20 (1919), pp. 146*).—This is the annual directory of public institutions and associations for the advancement of Danish agriculture in its various branches. A list of periodicals published in Denmark is appended.

**Georgia State plan for vocational education under the Smith-Hughes law, 1918** (*Ga. State Vocat. Bd. [Bul.] 4 (1918), pp. 47*).—This is an outline of the plan for vocational education in Georgia for 1918–19. It is proposed to use 50 per cent of the funds available for training teachers for agricultural subjects, 20 per cent for home economics subjects, and 30 per cent for trade and industrial subjects. The length of the course for the training of white teachers of agriculture is four years, or 144 semester hours, and of colored teachers, one year. An outline is given of the 4-year agricultural course. Apprentice teaching of at least 12 weeks will be done in congressional district agricultural schools and rural county high schools or departments of agriculture in rural high schools.

**Home economics education: Organization and administration,** J. T. BERRY and A. E. RICHARDSON (*Fed. Bd. Vocat. Ed. Bul. 28 (1919), pp. 64*).—This bulletin discusses (1) the general provisions of the vocational education act with reference to the distribution of funds and administrative machinery, and their relation to home economics education; (2) special provisions relating to home economics education in all-day schools and part-time and evening schools or classes; (3) the training of teachers of vocational home economics under the Smith-Hughes Act.

A table showing the sequence of courses and the relationship of art and science subjects to home economics subjects; outlines of a suggested type of courses for all-day classes, including a 2-year course in which half of the day, or 15 hours a week, is devoted to home economics subjects and the other half to related and nonvocational subjects; 4-year courses for 6-hour and 5-hour school days, respectively, in which one-half of the time is devoted to home economics and related art and science; a suggested course in the use and preparation of food for part-time classes; a suggested course in clothing for the family for evening classes; and a tabular approximation of the time and distribution of subjects in a 4-year teacher-training course in vocational home economics of 120 semester hours, are included.

**Home making.—Lessons for the seventh and eighth grades in the rural schools of Indiana** (*Ind. State Dept. Pub. Instr. Bul. 31 (1918), Ser. I, pp. 14; J, pp. 14; K, pp. 11; L, pp. 8; M, pp. 15; N, pp. 13; O, pp. 14; P, pp. 12*).—This is a continuation of this series of monthly lessons previously noted (E. S. R., 39, p. 498). The subjects dealt with are Care of the Family in Health, Care of the Family in Sickness, Selection of Clothing, House Decoration, House Furnishing, Care of the House, Home Management, and How to Live.

**Suggestive lesson plans for teaching the budget,** H. C. GOODSPEED (*Madison, Wis.: State Dept. Pub. Instr., 1918, pp. 11*).—The material in this pamphlet comprises two lesson plans for children's budget and personal accounts and the household budget and accounts, respectively, a suggestive form for household accounts, and a dramatic exercise for 11 girls, entitled Our Budget. The lesson plans set forth the teacher's aim, points to be taught, and the method of presentation.

**Syllabus for nature study, humaneness, elementary agriculture, and homemaking** (*Univ. State N. Y. Bul. 675 (1918), pp. 52*).—This syllabus is designed to indicate the general scope and character of instruction to be given in nature study and humaneness in grades 1 to 6, and in agriculture and home making, taught by means of junior home projects, in grades 7 and 8 of the public schools of the State of New York.

**Supervised home project and club work** (*Ind. State Bd. Ed., Ed. Bul. 32 (1918), pp. 44, figs. 27*).—This bulletin deals with the organization and present status of home project work in Indiana, which is now on a permanent basis, and with factors that make project work successful. Notes on the work of Indiana club leaders are included.

**Prizes for boys' and girls' competitions** (*Agr. Gaz. Canada, 6 (1919), No. 3, pp. 265–274*).—This is a series of articles, prepared with a view to standardizing on a basis of experience the wide variation of information and practice with regard to prizes offered for boys' and girls' agricultural competitions. The articles present the views of responsible officials in Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Manitoba, Saskatchewan, and Alberta, and of various live-stock associations.

**School fairs in 1918** (*Agr. Gaz. Canada, 6 (1919), No. 1, pp. 60–77, figs. 13*).—This is a series of brief reports by agricultural education officials on school fair activities in 1918 in the Provinces of Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Manitoba, Saskatchewan, and Alberta.

**Rural community center movement** (*Agr. Gaz. Canada, 6 (1919), No. 9, pp. 809–815*).—Brief statements are made of the present status of this movement in the Provinces of Nova Scotia, Quebec, Ontario, Manitoba, and Alberta.

In Nova Scotia the traveling rural science teachers have made a beginning through the medium of school exhibitions, plays by the school children, debates, clubs, etc. The clergy are also assisting in bringing the church and the school together in a social way. In Quebec, where the movement began about 10 years ago, the factors that are believed to have played a large part in arousing an interest in this movement are the clergy and the county demonstrators, the homemakers' club, and Macdonald College, which, in August, 1918, held a two weeks' summer school for rural improvement which was attended by nearly 70 persons, chiefly country ministers. The movement received an impetus in Ontario with the passing of a bill and the voting of money for the establishment of community halls and athletic fields in rural districts. The text of the regulations passed under this act are given, also an outline of a course of lectures on rural conditions and problems offered by the University of Toronto in its department of social science. The movement in Manitoba is under the direction of the Social Service Council, a federation representing 24 provincial bodies. Its activities are indicated by the following five standing committees, viz, the public forum, better business, young people, public health, and recreation. Community halls are briefly discussed as valuable assets of the movement in Alberta.

## MISCELLANEOUS.

**Thirty-second Annual Report of Nebraska Station, 1918** (*Nebraska Sta. Rpt. 1918, pp. 44*).—This contains the organization list, a report of the work of the year, a report of the extension service of the college of agriculture, and a financial statement for the fiscal year ended June 30, 1918. The experimental work reported is for the most part abstracted elsewhere in this issue.

**Monthly bulletin of the Western Washington Substation** (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1919), No. 4, pp. 53–64, fig. 1*).—This number contains brief articles on the following subjects: Sheep for Farm Flocks, and Control of Canadian Thistles, both by W. A. Linklater; Summer Garden Practices, and Summer Pruning, both by J. L. Stahl; Summer *v.* Winter Feeding of Poultry, by Mr. and Mrs. G. R. Shoup; and Some Common Fruit Diseases, by A. Frank.

# NOTES.

**California University.**—A group of 96 soldiers of the Australian Expeditionary Forces has been enrolled by their Government at the Farm School at Davis for agricultural training, with special emphasis on irrigation as applied to intensive agriculture. About 70 per cent of these men have requested a twelve months' course of training and the remainder, a six months' course. They were chosen from about 1,000 applicants and 37 already owned their own farms, while the remainder have agreed to purchase lands in irrigated districts.

The university student enrollment now numbers nearly 9,000, necessitating 60 appointments to the faculty. Among these are A. H. Hoffman as assistant professor of agricultural engineering, Thomas Batchelder and A. M. Burton as instructors in animal husbandry and agricultural extension, respectively; and Miss Mary Van Camp as assistant in agricultural extension. C. B. Lipman, professor of soil chemistry and bacteriology, W. F. Gericke, assistant professor of soil chemistry, and A. M. Hendrickson, assistant professor of pomology, have been granted leaves of absence.

**Connecticut State Station.**—C. B. Morison, assistant in chemistry, has resigned to accept a position with the American Institute of Baking.

**Georgia Station.**—Dr. B. B. Higgins has returned from overseas service and resumed his duties as botanist and plant pathologist October 1. T. S. Buie has been appointed assistant agronomist, beginning December 1.

**Purdue University and Station.**—The largest freshman class in the history of the university is reported. The School of Agriculture has the largest enrollment of any of the schools in the university.

H. E. Allen has resigned to accept a position with the American Hereford Cattle Breeders' Association, and has been succeeded as assistant professor of animal husbandry by B. E. Pontius of the Massachusetts College. P. S. Lucas, assistant professor of dairy manufactures at the Oregon College has been appointed associate professor of dairy husbandry and assistant professor of dairying, and E. H. Leiendecker, assistant in dairying. W. O. Mills has resigned as assistant in dairy extension work to engage in farming.

W. B. Crooks, in charge of boys' and girls' calf club work, has been appointed assistant professor of animal husbandry to take charge of horse work. The new horse barn is nearing completion and it is planned to enlarge the pure-bred stud considerably.

Other recent appointments include J. B. Kendrick, George B. Newman, R. J. Piaster, and W. W. Ravsdimer as assistants, respectively, in vegetable pathology, entomology, extension work, and pomology; Thomas Jukes and R. B. Mulvey as assistants in soils; C. C. Barkdell, L. H. Crubbem, and A. S. Eldredge as deputy inspectors in the office of the State chemist; and E. C. Rowe and William F. Ricketts as inspectors in the creamery license division.

**Iowa College.**—F. B. Paddock, State entomologist of Texas, has accepted a position as State apiarist of Iowa and associate professor of zoology and ento-

mology in the college, vice F. Eric Miller, resigned to assume charge of apicultural work in the Ontario College July 1.

Kansas College and Station.—The entering class numbered nearly 900, a much larger number than in any previous year. The total enrollment, including short courses, is expected to reach at least 3,500, breaking all previous records.

The new swine building, for which the legislature appropriated $10,000, has been completed. The building is of the monitor type, 132 ft. long and 32 ft. wide, with a two-story center section 32 ft. wide and 40 ft. long. It contains pens for 45 brood sows, a herdsman's room, an office, ample storage space for feed, scales, a shower bath, and other modern features. A portion of the floor space is provided with facilities for conducting investigations on various types of floors.

In cooperation with the State Crop Improvement Association the department of agronomy has completed an inspection of 25,000 acres of Kanred wheat, grown by 572 members of the association. This is a part of the campaign to encourage the substitution of Kanred for other varieties in the hard wheat belt. The results of the inspection have been published by the association for the benefit of farmers wishing to buy the wheat for seed. About 50,000 acres of the new variety were grown in the State this year.

George S. Knapp has resigned as superintendent of the Garden City substation to become State irrigation commissioner, and has been succeeded by F. A. Wagner of the Bureau of Plant Industry of the U. S. Department of Agriculture. Plans are being made for material extensions in the irrigation investigations at Garden City following an appropriation from the last legislature for new electrical pumping equipment.

Dr. Theodore Macklin, professor of agricultural economics, has resigned to become associate professor of agricultural economics at the University of Wisconsin. Dr. R. K. Nabours, professor of zoology, is making an extended study of Karakul sheep in Asia.

Herbert F. Roberts, head of the department of botany, has resigned to accept an appointment in the department of botany of the University of Manitoba. A department of botany and plant pathology has been established in charge of L. E. Melchers. Other appointments include Dr. William E. Muldoon, associate professor of comparative medicine in the New York State Veterinary College, as associate professor of comparative medicine; Dr. H. F. Lienhardt as assistant professor of pathology; F. L. Thomsen as assistant professor of agricultural economics; Dr. L. Jean Bogert as head of the department of food; Miss Hildegarde Kneeland as professor of household economics; Miss Martha E. Pittman as assistant professor of the department of food economics and nutrition; Miss Clara Higgins as research assistant in poultry husbandry; Dr. F. C. Gates as assistant professor of botany; F. L. Hisaw, jr., as assistant professor of zoology and mammologist; B. C. Zimmerman as instructor in animal husbandry; Herschel Scott as instructor in agronomy; C. F. Huffman as assistant in dairy husbandry; and Charles H. Kitselman as assistant in animal abortion investigations. F. E. Colburn, photographer at the Iowa College, has been appointed head of the newly authorized department of illustrations, which will include the photographic and illustrative work of the college and station.

Kentucky University and Station.—The new judging pavilion, seating 600 people and with two additional classrooms, is nearing completion.

Misses Elizabeth H. and Marguerite J. Perry have resigned as seed analysts. Recent appointments include the following: Dr. W. D. Valleau, research assistant at the Minnesota Station, as plant pathologist; J. B. Kelley of the Iowa College as professor of agricultural engineering; G. W. Forster as instructor in farm management and agricultural economics; Dr. A. J. Steiner as assistant

veterinarian; J. R. Dawson as extension dairy specialist; E. M. Prewitt as assistant extension dairy specialist; Miss Marietta Eichelberger as instructor in nutrition; Miss Mabelle Cornell as instructor in textiles and clothing; Miss Marie Boterf as instructor in practice teaching in home economics; Miss Gertrude M. McCheyne of the Utah College, in charge of home demonstration agents; and Miss Dora Sonnenday, as extension specialist in cooking.

**Louisiana University and Stations.**—Dean and Director W. R. Dodson has tended his resignation after twenty-five years' service, effective January 1, 1920. E. C. Freeland, assistant research chemist, and J. H. Jolly, assistant chemist, have resigned to accept commercial positions with sugar factories in British Guiana and Havana, Cuba, respectively. Dr. F. V. Emerson, geologist for the station and in charge of soil survey work for the station, died October 11. E. A. Meier, a 1919 graduate of the university, has been appointed farm manager for the State Station at Baton Rouge.

**Massachusetts College and Station.**—John D. Willard, in charge of the extension work in marketing, has been appointed director of the extension service, beginning about January 1, 1920.

Mrs. Maria E. Fernald, collaborator in entomological work with her husband, Dr. C. H. Fernald, and author of A Catalog of the Coccidæ of the World, died October 6 at the age of eighty years.

**Mississippi College.**—Daniel Scoates, professor of rural engineering, has been appointed professor of agricultural engineering at the Texas College vice R. A. Andree, resigned, and has entered upon his duties.

**Missouri University and Station.**—Theodore Sexauer has been appointed professor of agricultural education. Other appointments include, as instructors, Mack M. Jones in agricultural engineering, Ray E. Miller and Donald W. Chittenden in animal husbandry, Percy Werner, jr., in dairy husbandry, and George W. Hervey in poultry husbandry; and as assistant, Charles W. Turner in dairy husbandry. Ralph Loomis has been appointed specialist in rural marketing; Ralph L. Mason, extension instructor in poultry husbandry; and Mark H. Kenny, extension assistant professor of dairy husbandry. The resignation is noted of W. B. Combs, assistant professor of dairy husbandry.

**Nebraska University and Station.**—Miss Alice Loomis, head of the department of home economics, has resigned to become director of home economics work for the Nebraska Board of Vocational Education, beginning September 1, and has been succeeded by Miss Margaret Fedde. J. W. Hendrickson has been appointed assistant professor of dairy husbandry and assistant dairy husbandman, vice W. B. Nevens, who resigned September 1 to take up post graduate work in the University of Illinois.

Other appointments include C. K. Shedd of the Iowa College and Station as professor of agricultural engineering and in charge of tractor testing for the State; C. C. Wiggans, research horticulturist of the Delaware Station, as associate professor of horticulture; William H. Savin as assistant professor of animal husbandry and assistant animal husbandman; and J. C. Russel as assistant professor of agronomy.

**New Jersey College and Stations.**—J. M. Hunter has resigned as professor of animal husbandry and animal husbandman to become manager of a large cattle farm in the State. L. E. Hazen resigned September 1 to become professor of farm engineering in the Oklahoma College. Robert Poultney has resigned as assistant extension specialist in dairying. Robert P. Armstrong has been appointed assistant professor of horticulture and assistant pomologist; M. S. Klink assistant professor of rural engineering; Charles B. Gentry assistant professor of agricultural education; and George W. Martin assistant

professor of botany. Arthur L. Prince has been appointed assistant chemist vice H. C. McLean, resigned; Robert F. Poole research assistant in plant pathology; and Lindley G. Cook assistant to the director. F. G. Helyar, director of short courses, has also been appointed professor of animal husbandry and animal husbandman.

**New Hampshire College and Station.**—Dr. H. R. Kraybill, assistant physiologist of the Division of Horticulture and Pomology of the U. S. Department of Agriculture, has been appointed professor of agricultural chemistry and head of the chemistry department of the station.

**Cornell University and Station.**—The College of Agriculture announces that it will award a limited number of free tuition scholarships to students from the devastated regions of France and Belgium. Holders of these scholarships may enter at any time before the close of the academic year 1922–23.

The department of rural economy has recently added several works of reference in economic history, particularly in the grain and provision trades. These include complete sets of a number of periodical price lists for over fifty years. These acquisitions and other promised gifts, when added to the material already in the university library, are expected to place the university in possession of an unusual amount of fundamental material for the study of economic history, prices, and the marketing of the great agricultural staples of the country.

At the New York State Fair, held at Syracuse, September 8 to 13, the College of Agriculture, as part of its work in rural social organization, presented several one-act plays in a "little country theater", to demonstrate the value of rural dramatics as a form of recreation to bring countryside communities together. It was also the aim to show how easily the plays could be presented.

Clark L. Thayer, instructor in floriculture, resigned October 1 to become associate professor of floriculture at the Massachusetts College. E. L. Worthen has been appointed extension professor of soil technology for the year 1919–20 vice E. O. Fippen, who has received a year's leave of absence.

**North Dakota College.**—Lieut. Horace A. Holaday of the Sanitary Corps, nutrition officer at Newport News, Va., and formerly professor of chemistry at the University of Idaho, has been appointed professor of physiological chemistry and head of the division of foods and physiological chemistry.

**Ohio State University.**—Clark S. Wheeler has resigned as director of the agricultural extension service, effective November 1, to engage in commercial work.

**Oklahoma College.**—W. T. Magee has been appointed associate professor of animal husbandry.

**Pennsylvania College and Station.**—Recent resignations include E. L. Worthen, associate professor of agronomy; George S. Bulkley, assistant professor of dairy husbandry; Dr. J. F. Olney, station bacteriologist; instructors W. W. Wood in agricultural extension, A. F. Yeager in pomology, and L. E. Yocum in botany; and assistants E. V. Bearer, agricultural education, C. G. Ferrari in agricultural chemistry, F. W. Knipe in farm mechanics, H. C. Yerger, jr., in dairy manufactures, and C. W. McDonald in animal husbandry. W. G. Edwards, J. W. Miller, Fred Hultz, and A. L. Beam have returned from military service. Among the new appointments are the following: As assistant professors, Walter B. Nissley in vegetable gardening extension and R. R. Welch in dairy husbandry extension; as instructors, G. M. Foulkrod in farm mechanics, John R. Eyer in economic entomology, Martin H. Knutsen in bacteriology, P. Thomas Ziegler in poultry husbandry, Harold B. Pierce in chemical agriculture, F. B. Lincoln in pomology, J. Stanley Cobb in agronomy, Lloyd W. Steelman in poultry husbandry extension, and J. Stanley Owens in agronomy ex-

tension; and as assistants, Carl G. Degen in agronomy, Miss Esther S. Mixer in chemical agriculture, Russell M. Love in dairy husbandry extension, D. H. Stewart in agricultural extension, and Ellis M. Christen in animal husbandry.

**Tennessee University.**—L. R. Hesler, assistant professor of plant pathology at Cornell University, has been appointed professor and head of the department of botany.

**Texas College and Station.**—J. W. Luker has been appointed superintendent of the feeding and breeding substation vice J. W. Jennings, resigned to engage in farming. Ross M. Sherwood has been appointed poultryman vice W. L. Mayer, resigned to engage in teaching, and J. B. McNulty has been appointed dairyman, beginning September 1; R. G. Brewer has been appointed assistant animal husbandman in sheep and goat investigations vice C. M. Hubbard, resigned to accept an appointment with the Washington College. Dr. M. C. Tanquary, associate professor of entomology and assistant in staple crop investigations at the Kansas College and Station, has been appointed chief of the division of entomology and State entomologist, beginning January 31, 1920, vice F. B. Paddock, whose appointment in the Iowa College and Station is noted on page 496. P. V. Ewing, animal husbandman in charge of swine investigations, W. E. Jackson, assistant entomologist, and Wellington T. Brink, executive assistant in charge of library and publication, have resigned to go into commercial work, effective September 30, December 1, and August 21, respectively.

**Utah College and Station.**—A new live-stock building has recently been completed at a cost of approximately $90,000, which will house the college and station departments of animal husbandry, dairy husbandry, poultry husbandry, range management, and veterinary science. The basement of the building will contain a modern commercial dairy.

B. L. Richards, Ph. D., has been appointed associate professor of botany.

**Vermont University and Station.**—Recent appointments include A. H. Gilbert as assistant professor of plant pathology and assistant pathologist in the station, and J. A. Newlander as instructor in animal husbandry.

**Virginia Truck Station.**—G. S. Watts resigned July 15 to become assistant horticulturist at the Massachusetts College and was succeeded August 15 by Floyd H. Keister.

**Washington Station.**—Two barns and a 120-ton tile silo are to be built at the Western Washington Substation at Puyallup at an estimated cost of $24,000. A tract of 60 acres of nearby land has recently been purchased. It is planned to improve the dairy herd, retaining the best of the Jerseys on hand and adding a group of Holstein-Friesians.

**West Virginia University.**—Dr. John L. Sheldon, in charge of work in botany and bacteriology the last 16 years, has resigned.

**Philippine College of Agriculture.**—The College of Veterinary Science has been transferred to Los Banos. This brings it in contact with the remaining work of the institution. A new entomology and plant pathology building has been completed.

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# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**Agricultural chemistry,** E. GAIN (*Chimie Agricole. Paris: Libr. J. B. Baillière, 1918, 2. ed., pp. 510, figs. 137*).—Owing to the advances made in agricultural chemistry since the first edition of this volume 23 years ago, the work has been entirely rewritten following the lines of the course in agricultural chemistry given by the author at the University of Nancy. The subject matter is treated under the five general headings of elements of general agronomy, physiology of the nutrition of plants, study of the soil and of the atmosphere considered from the point of view of the complex phenomena which control the nutrition of the plant and the fertility of the soil, fertilization of the soil, and the chemical composition of agricultural products.

**Industrial and agricultural chemistry in British Guiana; with a review of the work of Professor J. B. Harrison,** C. A. BROWNE (*Jour. Indus. and Engin. Chem., 11 (1919), No. 9, pp. 874–881, figs. 5*).—The author describes a few phases of agricultural and industrial chemistry in British Guiana as observed during a recent visit to the British Colonies of tropical America. The industries discussed are the sugar industry with the sugar by-products, alcoholic spirits and molascuit, gold, balata, the congealed latex of the true *Mimusops balata* used as a substitute for gutta percha, and bauxite. The article also includes a description of the researches upon tropical soils conducted by J. B. Harrison, head of the governmental Department of Science and Agriculture of British Guiana, and an account of the government laboratory in Georgetown.

**Bulletin from the analytical food laboratories in Surinam,** J. SACK (*Keuringsdienst Eet-en Drinkwaren Surinaamte, Bul. E (1919), pp. 21*).—This bulletin contains the results of analyses of various seeds for their fat and moisture content, together with the more important constants of the oils extracted from the seeds with carbon tetrachlorid. The seeds selected include many which according to the author have never been analyzed before.

**International catalogue of scientific literature. D.—Chemistry** (*Internat. Cat. Sci. Lit., 14 (1919), pp. VIII+761*).—The fourteenth annual issue of this catalogue (E. S. R., 37, p. 501) contains material received between September, 1914, and May, 1916.

**The volatile oils,** E. GILDEMEISTER and F. HOFFMANN (*Die Ätherischen Öle. Leipsic: Schimmel & Co., 1916, vol. 3, 2. ed., pp. XVIII+836, pls. 3, figs. 52*).—This is the second edition, edited by E. Gildemeister, of the third volume of this work, the second volume of which has been previously noted (E. S. R., 30, p. 310).

**American tomato seed oil**, G. S. JAMIESON and H. S. BAILEY (*Jour. Indus. and Engin. Chem., 11 (1919), No. 9, pp. 850–852*).—This investigation, reported from the Bureau of Chemistry, U. S. Department of Agriculture, includes an extensive study to determine whether arachidic acid is present in tomato seed oil and determinations of the analytical constants of the oil.

Although the Renard test indicated the presence of a considerable amount of arachidic acid in tomato seed oil, attempts to isolate the acid by various methods resulted in a very small yield, the largest amount being obtained by fractional distillation under diminished pressure of the methyl esters of the solid fatty acids obtained from the oil by the lead salt-ether method. The yield of acid melting at 77° C. indicated that the oil contained about 0.4 per cent of arachidic acid. The conclusion is drawn that the Renard test when applied to unfamiliar oils can not be relied upon to indicate the quantity of arachidic acid present.

A table is given of the physical and chemical constants of nine authentic samples of American tomato seed oil.

**Contribution to the study of the ash-constituents of plants**, L. and D. LEROUX (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 7, pp. 207–209*).—A table is given of the ash-constituents of certain roots and tubercles, including those of the potato, comfrey, dahlia, burdock, field thistle, gentian, carrot, turnip, water lily, nettle, and fern.

**The composition of the ash of crab grass (Digitaria sanguinalis) as affected by the soil in which it is grown**, G. D. BUCKNER (*Jour. Amer. Chem. Soc., 41 (1919), No. 9, pp. 1384, 1385*).—Analyses made at the Kentucky Experiment Station of samples of crab grass (*Digitaria sanguinalis*) grown in garden soil and in a limestone roadway are reported.

The sample grown in the limestone roadway contained approximately 16 per cent less ash, 18.8 per cent less $K_2O$, 22.7 per cent more $P_2O_5$, 44 per cent more CaO, and 27.6 per cent more MgO than the samples grown in garden soil. The percentage of silica was approximately the same in the two samples.

"The outstanding feature in connection with the growth of these two samples of crab grass is that the absorption and retention of these different amounts of calcium, magnesium, phosphorus, and potassium cause no observable difference in their external appearance."

**Physical and chemical properties of liquid hydrocyanic acid**, G. P. GRAY and E. R. HULBRIT (*California Sta. Bul. 308 (1919), pp. 408–428*).—The use of hydrocyanic acid gas in citrus fumigation led to the study of the physical and chemical properties of the liquid here reported.

"Two test runs of the liquefying plant were made in order to establish a basis of settlement between plant and fumigator. The liquid hydrocyanic acid recovered in the first test run was 80.1 per cent of the greatest possible yield; in the second, 76.3 per cent; an average of 78.2 per cent. The average purity of the liquid obtained in the first run was 97.57 per cent; in the second, 94.27 per cent. The average purity of the liquid delivered during the past fumigating season was above 95 per cent absolute hydrocyanic acid. Material of 95 per cent or greater purity is considered of a satisfactory grade. As the plant was operated last season, the following is believed to be a fair return per case of 200 lbs. of sodium cyanid: (1) A minimum of 85 lbs. of absolute hydrocyanic acid; or (2) a minimum of 90 lbs. of liquid testing not less than 95 per cent purity." An appended table prepared by the authors shows the weights and corresponding volumes of various grades of commercial liquid and the quantities thereof corresponding to various percentages of the maximum yield.

It was found that the acid is miscible with water in all proportions and will not stratify upon standing. Hydrocyanic acid evaporates more rapidly than water from dilute mixtures of the two. Complete data have been obtained on

the specific gravity of commercial liquid hydrocyanic acid testing from 70 per cent to 100 per cent purity and upon the extent of variation of hydrometer readings as affected by temperature, and these figures are given in the form of reference tables, by means of which it is possible to determine the quality of a liquid in a moment's time by the use of a hydrometer graduated either in specific gravity or Baumé degrees. These data have made possible the construction of a cyanometer, a hydrometer graduated directly in percentages of hydrocyanic acid and provided with a simple table of temperature corrections.

"A method of analysis has been selected and shown to give concordant results within 0.2 per cent. The development of any color, usually yellow, or an odor of ammonia may be taken as a warning of incipient decomposition of the liquid. Factors and materials favoring decomposition are water in excess of 5 per cent; high temperatures; residue from a decomposed liquid; all alkalis, nitric acid, sodium cyanid; soap; or contact with lead, commercial tin, impure zinc, solder, cast-iron, or steel. The following metals were found to be highly resistant to the acid, somewhat in the order named: Aluminum, block tin, pure zinc, brass, nickel, silver, and copper. Aluminum is the most promising material for the construction of delivery drums. Brass fittings are permissible."

**An adiabatic bomb calorimeter**, E. B. Holland, J. C. Reed, and J. P. Buckley (*Chem. and Metallurg. Engin., 21 (1919), No. 4, pp. 190, 191, fig. 1*).—The authors describe certain improvements introduced at the Massachusetts Experiment Station in the construction, thermometers, and lens of an adiabatic bomb calorimeter of the Berthelot-Mahler-Kroecker type. A diagram is given of the calorimeter as modified.

**Electrical apparatus for use in electrometric titration**, H. S. Roberts (*Jour. Amer. Chem. Soc., 41 (1919), No. 9, pp. 1358–1362, figs. 2*).—The author points out that the choice of apparatus for use in electrometric titration is very different from that of potentiometric apparatus for other purposes owing to the fact that the interest lies in relative rather than absolute values of the electromotive force developed during the titration, that the electromotive force frequently changes sign, and that the apparatus must often be used in an atmosphere charged with acid fumes.

Two simplified potentiometers for use in electrometric titration are described and illustrated, and suitable forms of galvanometers are mentioned.

**Indicator test papers**, I. M. Kolthoff (*Pharm. Weekbl., 56 (1919), No. 7, pp. 175–187; abs. in Chem. Abs., 13 (1919), No. 15, p. 1689*).—A study is reported of the influence upon indicator papers of various factors such as the kind of paper employed and its preliminary treatment with various reagents, the concentration of the solution used, the manner of testing, and the nature of the solution. This is followed by a discussion of the possible uses of indicator papers, the conclusion being drawn that their chief value is in qualitative analysis within definite limits of H-ion concentration.

A table is included of relative sensitivities of various indicator papers.

**A rapid hydrogen electrode method for determination of hydrogen-ion concentrations in bacterial cultures or in other turbid or colored solutions**, H. M. Jones (*Jour. Infect. Diseases, 25 (1919), No. 3, pp. 262–268, figs. 2*).—A simple form of hydrogen electrode apparatus is described which is said to allow rapid saturation with hydrogen gas and to be accurate to at least 0.01 pH. A technique combining the indicator and gas-chain method is outlined for use when large numbers of determinations are to be made, as in bacterial cultures. This consists of taking a portion (2 cc.) of each solution to be tested, diluting with 4 cc. of distilled water, and after arranging the tubes in groups with reference to their degree of turbidity, placing each group in separate rows in test tube racks. Equal amounts of some indicator with a range of color

change adapted to the probable acidities of the solution are placed in each tube and shaken. The tubes are then collected in subgroups of similar colors, and one specimen of each subgroup is tested with the hydrogen electrode to determine the H-ion concentration of the entire subgroup.

**A sensitive reaction of manganese salts**, H. CARON and D. RAQUET (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 6, p. 174*).—The authors state that manganese salts in slightly acid solution react in the cold with an excess of an alkaline oxalate and certain oxidizing agents (bichromates, hypochlorites, and sodium peroxid) to form an alkaline manganic oxalate of a deep red color. Potassium oxalate, acetic acid, and potassium hypochlorite are recommended as furnishing the most sensitive reaction, it being possible to detect manganese in a 1:200,000 solution.

Iron in quantity is said to mask the color reaction, while zinc does not interfere with the reaction provided sufficient oxalate is used to dissolve the precipitate of zinc oxalate formed and enough acetic acid is added subsequently to acidify the solution.

The reaction, while less sensitive than those based on the transformation of manganese into permanganic acid by lead dioxid, persulphates, or bismuth peroxid, has the advantage of not being interfered with by chlorids.

**Specific colored reaction of oxalates**, H. CARON and D. RAQUET (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 7, p. 205*).—The reaction noted above is said to be equally applicable as a test for oxalic acid and oxalates in amounts as small as 0.01 gm. In the case of free oxalic acid or a solution having quite a strong mineral acidity, sodium acetate should be used in place of acetic acid. Insoluble oxalates should be boiled for a few minutes with a solution of an alkaline carbonate, and the test made with the cold filtered liquid acidified with acetic acid. Phosphoric, hydrofluoric acid, etc., are said not to interfere with the reaction.

**Iodometric studies**, I. M. KOLTHOFF (*Pharm. Weekbl., 56 (1919), Nos. 13, pp. 391–404; 14, pp. 426–438; 15, pp. 460–465; 16, pp. 514–524; 18, pp. 572–585; 19, pp. 621–634; 20, pp. 644–657, figs. 2; abs. in Chem. Abs., 13 (1919), Nos. 13, pp. 1434, 1435; 14, pp. 1569, 1570*).—These numbers report, respectively, a series of quantitative iodometric studies under the following headings: I, Introduction; II, the starch iodid reaction; III, the iodometric bromate determination; IV, the iodometric determination of chloric acid; V, the iodometric determination of chromic acid (with E. H. Vogelenzang); VI, the reaction of thiosulphate with iodin; VII, the reaction between arsenic trioxid and iodin; and VIII, standardization of sodium thiosulphate solutions.

**The determination of nitrogen by the Kjeldahl process**, A. VILLIERS and A. MOREAU-TALON (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 6, pp. 183–185*).—The authors recommend the use of both potassium sulphate and mercury in the digestion process, the sulphate being added at the beginning and the mercury (1 gm.) after the solution has become nearly colorless. The solution is heated gently for 15 minutes or more after the addition of the mercury, and is then distilled into dilute hydrochloric acid and the distillate evaporated to dryness. The nitrogen is calculated by a gravimetric determination of the ammonium chlorid formed, or by a volumetric determination with a standardized solution of silver nitrate using potassium chromate as indicator.

**Notes on potash determination**, L. G. L. STEUERWALD (*Arch. Suikerindus. Nederland. Indië, 27 (1919), No. 9, pp. 435–438; abs. in Chem. Abs., 13 (1919), No. 13, p. 1436*).—A modified method for determining potash by precipitation as potassium platinic chlorid and reduction to metallic platinum is described in which sodium formate is used as the reducing agent.

**The estimation of sulphates in a concentrated electrolyte and the determination of sulphur in foods**, V. K. KRIEBLE and A. W. MANGUM (*Jour. Amer. Chem. Soc., 41 (1919), No. 9, pp. 1317–1328*).—As the outcome of a study of the oxidation of food by sodium peroxid and the precipitation of sulphates as barium sulphate in solutions containing large amounts of sodium chlorid, a modified method is described which is considered by the authors to be a decided improvement both in the oxidation process and in the final estimation of sulphates in materials such as food samples in which the sulphur content is low.

Danger of the samples either exploding or taking fire during the oxidation is avoided by mixing a suitable quantity of sodium carbonate with the second addition of sodium peroxid in the fusion, and subsequently heating just one side of the nickel crucible in order to start the oxidation locally and keep the rest of the mixture in the crucible relatively cool.

The technique of the precipitation of the sulphates as barium sulphate is as follows: The solution of the oxidized material from 2 or 3 gm. of the original sample is neutralized with concentrated hydrochloric acid, brought to a volume of 350 cc. and heated to boiling on a hot plate. It is then removed from the hot plate and the barium sulphate precipitated by adding slowly with a dropper 10 cc. of a 10 per cent barium chlorid solution. After standing for 48 hours the mixture is evaporated to dryness on a hot plate, the precipitate dissolved in a little water, and from 1 to 2 cc. of concentrated hydrochloric acid added. After standing for 18 hours longer, the precipitate is collected in a Gooch crucible, washed, dried, and ignited to constant weight.

It is stated that the results obtained by this method will be high, and should be corrected by a comparison of the amount of barium sulphate obtained by making a determination on a solution of sodium or potassium sulphate of such strength that the amount taken should give about the same amount of barium sulphate as obtained from the food.

**The determination of lactose and of albuminoids in autoclaved milk and in milk preserved by the addition of potassium dichromate**, P. DEFRANCE (*Ann. Falsif., 12 (1919), No. 125–126, pp. 78, 79*).—The author refers to the conclusions of Porcher and Bonis previously noted (E. S. R., 40, p. 613) that the polarimetric determination of lactose in milk preserved with sodium bicarbonate is unreliable, and states that he has arrived at the same conclusion in testing milk preserved with potassium dichromate. In his opinion, however, the change in rotatory power should be attributed to alterations in the casein rather than in the lactose.

**On the estimation of sugar in blood**, H. MACLEAN (*Biochem. Jour., 13 (1919), No. 2, pp. 135–147, figs. 2*).—A method for the estimation of sugar in the blood is described which is essentially a modification of a method previously introduced by the author.[1]

The principle of the method consists in separating the proteins by heat coagulation in an acid saline solution and subsequently precipitating any remaining traces of protein by the use of dialyzed iron. The sugar in an aliquot part of the protein-free filtrate is estimated by boiling the liquid with an alkaline copper solution containing potassium iodate and iodid and treating the solution containing the reduced cuprous oxid in suspension with a slight excess of hydrochloric acid. This interacts with the potassium iodate and iodid, liberating iodin equivalent to the amount of potassium iodate in the solution. The cuprous oxid is changed to cuprous chlorid which immediately reacts with the free iodin. The amount of sugar is calculated by a determination of the iodin used.

[1] Jour. Physiol., 50 (1916), No. 3, pp. 168–182.

For blood sugar determinations the method is said to be applicable to 1 cc. or smaller amounts. Detailed instructions are given for the preparation of the various solutions required and for the technique of the procedure when 1 cc. and 0.2 cc. of blood, respectively, is used.

**The picric acid method for the estimation of sugar in blood and a comparison of this method with that of Maclean**, O. L. V. DE WESSELOW (*Biochem. Jour., 13 (1919), No. 2, pp. 148–152, fig. 1*).—A comparison of the method of Maclean noted above and the picric acid method of Benedict (E. S. R., 39, p. 112) is reported.

The Benedict method was found to give results from 30 to 50 per cent in excess of those obtained by the Maclean method.

"The high results appear to be chiefly due to the presence of an interfering substance or substances mainly concentrated in the corpuscles but present to some extent in the plasma also; this substance reacts with the picric solution at an early stage of the heating. Creatinin probably plays a large part in this reaction. On account of the influence of this interfering factor the accurate estimation of sugar in whole blood by the picric acid method as described by Benedict is impossible."

**Notes on the determination of water solubles in leather**, R. W. FREY and I. D. CLARKE (*Jour. Amer. Leather Chem. Assoc., 14 (1919), No. 9, pp. 488–499*).—Data obtained at the Bureau of Chemistry, U. S. Department of Agriculture, are presented indicating the influence of various factors on the determination of water solubles in leather, and the recommendation is made that the Official Method should be revised and standardized.

**The industries of the farm**, A. LARBALETRIER (*Les Industries de la Ferme. Paris: Libr. Larousse, 2. ed., pp. 216, figs. 160*).—The industries treated in this volume are milling, baking, starch, sugar, wine, cider, beef, distilled beverages, vinegar, oils, milk, butter, cheese, and preserves.

**Methods of preservation of fruits and vegetables**, A. MANARESI (*Metodi di Conservazione dei Frutti e Degli Ortaggi. Casale Monferrato, Italy: Marescalchi Bros., 1915, pp. XVII+555*).—This volume contains general directions for the preservation of fruits and vegetables by inert substances, cold, desiccation, antiseptics, and heat. Special directions are given for certain products under each class, and a bibliography is included for each section.

**Fruit preserves prepared in the cold without the addition of sugar, alcohol, or antiseptics**, G. BERTRAND (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 23, pp. 1162–1164*).—The author reports that out of 47 jars of different fruits canned in cold water, after a preliminary washing but with no further treatment, 17 were in perfect condition at the end of 11 months. In the other jars there was greater or less indication of alcoholic fermentation but no evidence of other changes. As a result of this study the author concludes that it is possible to preserve fruits by the elimination of air in flasks filled with water without the necessity of adding sugar or any other substance, or of heating the fruit.

**The mechanism of the preservation of fruits in cold water**, G. BERTRAND (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 25, pp. 1285–1288*).—The theory is advanced that the preservation of fruit by the method noted above is due to the action upon the dissolved oxygen originally present of diastases present in the fruits, thus rendering the medium anaerobic and preventing fermentation. The chances of success in the use of this method are consequently thought to depend upon the number, nature, and degree of vitality of the organisms present in the flask, upon the acidity of the fruits, and above all upon the intensity of the biochemical processes which bring about the disappearance of the dissolved oxygen. Cut fruits are apparently better suited to this proc-

ess than whole fruits on account of the more rapid solution of the cellular juices in the water.

**The composition and calorific value of sirups and molasses derived from sugar cane**, C. A. Browne (*Jour. Amer. Chem. Soc., 41 (1919), No. 9, pp. 1432–1440*).—This paper contains a brief outline of the changes in constituents of sugar cane juice during sirup manufacture and the resulting changes in calorific value of the juice, followed by experimental data on the composition and calorific value of eight samples of sirups and molasses. These samples included the clear mother liquor from pure concentrated sugar cane juice, open-kettle molasses, a sample of first Cuban molasses, three of refiner's sirup, and one of refiner's low grade molasses.

The conclusions drawn from the investigation are as follows:

In the manufacture of sirups and molasses by the ordinary process of defecation with lime there is a progressive increase in the calorific value and carbon content of the organic nonsugars, owing to the formation of dehydration products such as caramel, saccharin, glycinic acid and its humoid derivatives. Filtration over bone black results in a considerable removal of the lime salts of glycinic acid with a decrease in the calorific value and carbon content of the organic nonsugars. Fewer dehydration products are formed in the manufacture of molasses by the sulfitation than by the defecation process, the result being a molasses of lighter color and lower calorific value and carbon content of the organic nonsugars.

The calorific value of the total solids in the sirups and molasses varied between 3.6 and 3.8 calories per gram of dry substance, the average being about 3.7 calories. The calorific value of the organic matter in high-grade open-kettle sulfitation molasses and in high-grade refinery sirups was found to be about 3.9 calories, and in sugarhouse defecation molasses and refinery molasses 4 calories per gram of dry organic substance. The calorific value of the organic nonsugars in refinery sirups was between 4.04 and 4.16 calories, and in sugarhouse and refinery molasses 4.44 and 4.6 calories, respectively, per gram of dry substance.

The carbon content of the organic nonsugars in open-kettle and refinery sirups varied between 40.32 and 42.74 per cent and that of the organic nonsugars in a sugarhouse and refinery molasses 48.17 and 49 per cent, respectively, per gram of dry substance.

The results of this work are thought by the author to have some bearing upon questions of nomenclature, in that refinery sirups which have been filtered over bone black differ from defecation molasses so distinctly in the composition and calorific value of their organic nonsugars that in a chemical sense they should not be termed molasses.

**The deterioration of manufactured cane sugar by molds**, N. and L. Kopeloff (*Jour. Indus. and Engin. Chem., 11 (1919), No. 9, pp. 845–850*).—Essentially noted from another source (E. S. R., 41, p. 416).

**Production of glycerin from sugar by fermentation**, J. R. Eoff, W. V. Linder, and G. F. Beyer (*Jour. Indus. and Engin. Chem., 11 (1919), No. 9, pp. 842–845, fig. 1*).—This is a report of an investigation, conducted by the Division of Chemistry of the U. S. Bureau of Internal Revenue, on the problem of glycerin production from sugar by fermentation.

The yeast finally selected as the best glycerin former was *Saccharomyces ellipsoideus* (var. Steinberg). Favorable results were obtained from solutions of inedible black strap Porto Rican molasses, mixtures of corn sugar and malt sprouts solutions, and solutions of corn sugar and metallic salts. The first formed the cheapest source of sugar and proved to be as efficient for the production of glycerin as the more expensive mixtures.

It was found that the yield of glycerin was increased by fermentation in alkaline solution. Dry soda ash in proportions of about 5 per cent of the mash proved most favorable as the alkaline agent. The most favorable temperatures for the fermentation were found to be between 30 and 32° C. and the concentration of sugar solution between 17.5 and 20 gm. of sugar per 100 cc. Upon completion of the fermentation, from 20 to 25 per cent of the sugar originally in the mash is converted into glycerin and practically all of the remaining sugar into alcohol and carbon dioxid. On purification of the fermented mash and distillation in a vacuum evaporator, about 50 per cent of the glycerin originally in the mash can be recovered, and by redistillation of the crude product a satisfactory dynamite glycerin can be obtained.

It is thought that the alcohol which can be recovered in this process will be of sufficient value to balance the cost of materials and production, and that the only cost to be considered for the glycerin is that of purification and distillation.

The process as carried out under factory conditions is described, and a diagram is given of the experimental glycerin still employed.

**Mannose yeast,** G. MEZZADROLI (*Staz. Sper. Agr. Ital., 51 (1918), No. 7–8, pp. 306–311*).—In searching for a suitable yeast for the fermentation of the must obtained from vegetable ivory (fruit of *Phytelephas macrocarpa*) waste, remaining from the manufacture of buttons, a yeast obtained from Puglia was found to have the most marked action, causing a regular and rapid production of alcohol. This yeast was found to be nonspecific in that sorbose, sucrose, maltose, lactose, raffinose, and inulin were acted upon with almost equal rapidity. The author is of the opinion that this yeast, on account of its polyvalent enzym action, may have some application in the distilling industry, particularly for the fermentation of sugar cane molasses.

The cytological and biochemical properties of the yeast are described in detail.

**Conference on recent developments in the fermentation industries** (*Jour. Soc. Chem. Indus., 38 (1919) No. 14, pp. 271T–286T*).—The report of this conference, held July 17, 1919, in connection with the annual meeting of the Society of Chemical Industry (England), includes papers on The Manufacture of Acetone, by F. Nathan, The Acetone Fermentation Process and its Technical Application, by A. Gill, Employment of Microorganisms in the Service of Industrial Chemistry, and A Plea for a National Institute of Industrial Microbiology, by A. C. Chapman.

**Potash from kelp: The experimental plant of the United States Department of Agriculture; preliminary paper,** J. W. TURRENTINE and P. S. SHOAFF (*Jour. Indus. and Engin. Chem., 11 (1919), No. 9, pp. 864–874, figs. 6*).—A detailed description is given of the experimental kelp-potash plant of the U. S. Department of Agriculture at Summerland, Cal., which was "designed for the determination of the best methods of processing kelp for the extraction of potash salts and the simultaneous recovery of other valuable products, was erected during the summer of 1917, and put into operation in the early fall of that year.

"One hundred tons of raw kelp per day are subjected to a process involving drying, destructive distillation, lixiviation, evaporation, and fractional crystallization for the preparation of high-grade potassium chlorid.

"The by-products kelp oils, creosote, pitch, ammonia, bleaching carbons, salt, and iodin are yielded in commercial quantities by this process. The main problem now in hand is their commercialization. It is confidently believed that they will be made to yield sufficient revenue to enable the main product, potash salts, to be marketed sucessfully in competition with potash from foreign sources.

"Complete operating cost data are being tabulated covering the various details of manufacture. These, together with full specifications and designs, will be made available for the use of the interested public. The results obtained to date indicate that it will be possible to establish on kelp as the basic raw material a new American chemical industry of considerable size and of importance and usefulness to the nation."

Charts are included illustrating the general operations and products of the plant, the products of the dry distillation process, and the organization and personnel of the staff.

**Hemlock bark as a source of tannin**, V. P. EDWARDES (*Chem. Engin., 27 (1919), No. 8, pp. 178–182, fig. 1*).—This paper gives the results of an investigation conducted at the Forest Products Laboratory, Madison, Wis., of the value of hemlock bark as a source of tannin.

Analytical data on five runs of hemlock bark before and after drying indicated that the tannin content of the bark is not appreciably lowered in the drying process. The percentage of tannin (on the bone-dry basis) after drying varied from 9.1 to 10.5 per cent.

Statistics are given of the amount of hemlock bark available in different States, from which it is estimated that if all the bark could be recovered by improved barking processes there would be more than enough to supply the needs of the tanning industry.

## METEOROLOGY.

**Climatological data for the United States by sections** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 5 (1918), No. 13 pp. 388, pls. 6, figs. 48*).—Summaries and detailed tabulated statements of climatological data for the year 1918 are given for each State.

**Meteorological observations at the Massachusetts Agricultural Experiment Station**, J. E. OSTRANDER and G. A. SMITH (*Massachusetts Sta. Met. Buls. 367–368 (1919), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1919, are presented. The data are briefly discussed in general notes on the weather of each month.

**Meteorology**, J. B. TRIVETT (*N. S. Wales Statis. Reg., 1917–18, pt. 4, pp. 223–307*).—Tables are given which summarize the results of observations at Sydney, New South Wales, on atmospheric pressure, 1917; temperature, 1876–1917; rainfall, 1840–1917; wind, humidity, dew, and fog, 1917; and heavy rainfalls since 1891. Similar data are also summarized for various other stations, 1906–1917, and the general meteorological conditions of New South Wales for each month of 1917 are briefly described.

**The mild winter of 1918–19**, C. F. BROOKS (*Science, n. ser., 50 (1919), No. 1285, pp. 165, 166*).—It is stated that "except in the South, the mean temperatures of last December and January were generally 15° F. higher than during the same period of a year before. The snowfall was practically negligible as compared with the great accumulations of the previous 'old-fashioned' winter [E. S. R., 39, p. 114]. . . . The region west of the Rockies, which was so warm in the winter of 1917–18, was generally unusually cold in December, 1918, and in much of Utah, northern Arizona, and New Mexico, where the depth of snow was great, in January, and much of February, 1919, as well. Throughout the rest of the region, the past winter was not very unusual."

A table is given which shows the contrasts in temperature and snowfall in a number of representative cities in the United States.

**Some characteristics of the rainfall of the United States,** R. DeC. WARD (*Sci. Mo., 9 (1919), No. 3, pp. 210–223*).—This is a brief critical digest of the more important literature on this subject, dealt with under the following heads: Annual and monthly variability of rainfall, consecutive days with and without precipitation, droughts, hourly frequency of rainfall, heavy rainfalls in short periods, instrumental records and noninstrumental evidence of secular variations in rainfall, and the climatologist's attitude regarding noninstrumental evidence of climatic changes. It is stated that in the face of the conflicting testimony on the part of the experts, "the conservative climatologist may well remain open-minded" on the question of noninstrumental evidence of secular climatic changes.

**Rainfall régimes in Mexico,** E. LÓPEZ (*Rev. Agr. [Mex.], 4 (1919), No. 5–6, pp. 213–218, figs. 2*).—The régimes defined and discussed are subtropical calms, simple tropical, tropical and monsoon, tropical and northern, maritime proper, and maritime and northern. The importance of the matter from the standpoint of agriculture is briefly discussed.

**The relation of rainfall to configuration,** C. SALTER (*London: Inst. Water Engin., 1918, pp. 37, pls. 2, figs. 7; rev. in Nature [London], 103 (1919), No. 2579, p. 91*).—This article reports a study based upon 35 to 40 years' observations by the British Rainfall Association at a large number of stations but at altitudes as a rule below 1,000 ft. The physical process of rain formation is discussed, and rainfall is classified according to the different circumstances under which air is forced to ascend as convectional, cyclonic, or orographic, the last named being caused by interference of rising land, which makes the moisture-laden air rise.

The first two types are but slightly affected by the configuration of the land. Orographic rain is the predominant type in the British Isles, and the best examples of it occur near the seacoast. It is not frequent in winter. Elevations of only a few feet near sea level affect the amount of rainfall. "The rate of increase per 100 ft. of altitude varies within wide limits. It is lower on slopes parallel to the prevailing winds than on slopes at right angles. On fairly steep ridges close to the sea the maximum rainfall often occurs slightly on the leeward side of the crest." The increase in such cases may be from 1.5 to 2 in. per hundred feet of altitude, but may be smaller when the slope of the land is reduced. Rainfall diminishes steadily on leeward slopes of high land.

**Fertilizing value of rain and snow,** F. T. SHUTT (*Canada Expt. Farms Rpt. 1918, p. 19*).—In the eleventh year of this investigation (E. S. R., 40, p. 724), 68 samples of rain and 35 samples of snow were analyzed representing a total precipitation of 32.86 in. The total nitrogen supplied amounted to 6.259 lbs. per acre.

**The period between blooming and ripening,** J. HEGYFOKY (*Met. Ztschr. [Brunswick], 36 (1919), No. 3–4, pp. 79–84*).—Observations in Germany on this point with various trees, shrubs, and cultivated plants, and under varying climatic conditions are summarized and discussed, particularly with reference to the conditions causing variations in the length of the period from blooming to ripening.

## SOILS—FERTILIZERS.

**The classification of humus-free and humus-poor mineral soils of Sweden according to their consistencies,** A. ATTERBERG (*Internat. Mitt. Bodenk., 6 (1916), No. 1, pp. 27–37, fig. 1*).—The author offers a new classification of the

mineral soils of Sweden which contain either little or no humus, on the basis of consistency. The grouping and classification is as follows:

Group I.—Plastic clays and clay soils containing little or no humus.
Class 1. Highly plastic clay in which the degree of stickiness lies between the flowing limit and the rolling-out limit.
Class 2. Dry plastic clay and clay loam.
Subclass A. Loamy clay of dry plasticity, low flow limit and high firmness.
Subclass B. Loamy clay of dry plasticity, high flow limit, and low firmness.
Subclass C. Poor clay of low consistency and plasticity.
Class 3. Siliceous and sandy clays.
Group II.—Loams of low plasticity which have a relatively high binding power.
Class 1. Heavy clay loam, hard and firm when dry and loose and easily worked when moist.
Class 2. Lighter loams of low firmness.
Subclass A. Fine sandy loam.
Subclass B. Poor weathered clay loam of sedimentary origin.
Class 3. Siliceous and coarse sandy loam.
Group III.—Sandy soils of loose texture, very low firmness, and practically no consistency.
Class 1. Fine sands.
Class 2. Coarse sands.
Class 3. Siliceous sands.

**The classification of the mineral soils of high humus content of Sweden.** A. Atterberg and S. Johansson (*Internat. Mitt. Bodenk., 6 (1916), No. 1, pp. 38–59, figs. 3*).—Studies of the mineral soils of Sweden, of high humus content, with reference to determining their proper classification, are reported. The results obtained indicate that these soils should be classified into the four following main groups:

(I). Nonplastic soils containing from 3 to 6 per cent humus.
(II). Nonplastic black soils containing over 6 per cent humus.
Subclass 1. Soils with low flow limit containing from 8 to 9 per cent humus.
Subclass 2. Soils with high flow limit containing from 10 to 22 per cent humus.
(III). Kieselguhr black soils containing from 12 to 21 per cent humus and characterized by the high content of diatomaceous residues and high flow limit.
(IV). Clays rich in humus of high plasticity.
Subclass 1. Soils of low consistency.
Subclass 2. Soils of medium consistency.
Subclass 3. Soils of high consistency.

On the basis of these results it is concluded that mechanical analyses are superfluous for these soils, and that volume weight and flow limit determinations are sufficient for their classification.

**Soil survey of the Los Angeles area, Cal.**, J. W. Nelson, C. J. Zinn, A. T. Strahorn, E. B. Watson, and J. E. Dunn (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 78, pls. 3, fig. 1, map 1*).—This report, prepared in cooperation with the California University Experiment Station, deals with the soils of an area of 360,320 acres in southern California which topographically consists of a fringe of low hills and a low alluvial plain. The area is

well drained. With reference to origin the soils of the area are residual soils, old valley-filling, and coastal plain soils, recent alluvial fan and flood-plain soils, wind laid soils, and miscellaneous material. Thirty soil types of 13 series and 4 miscellaneous types are mapped, of which the Ramona loam, the Hanford fine sandy loam, and rough broken land cover 17.6, 15.9, and 10.3 per cents of the area, respectively.

"In the southeastern third of the area the water table is prevailingly high, and injurious amounts of alkali have accumulated over considerable areas. Alkali occurs both in continuous areas of small extent and in patches, as well as in amounts too small to affect plant growth. Sodium sulphate prevails over inland areas, and sodium chlorid or common salt in the marshes along the coast. Black alkali has developed in some small accumulations. Considerable areas have been drained and much of the alkali removed by leaching."

**Analyses of soils of Terrell County [Ga.], W. A. Worsham, jr. et al. (*Ga. State Col. Agr. Bul. 172 (1919), pp. 52, figs. 2*).**—Chemical analyses are reported of the soils of an area of 213,760 acres in southwestern Georgia, lying entirely within the coastal plains soil province. They show that the principal upland soils are markedly deficient in nitrogen, phosphoric acid, and potash, nitrogen being the relative limiting factor.

**Preliminary report on the geology of east central Minnesota including the Cuyuna iron-ore district, E. C. Harder and A. W. Johnston (*Univ. Minn., Geol. Survey Bul. 15 (1918), pp. VI+178, pls. 22*).**—This report should be of value in a study of the soils of the region.

**Rate and extent of solubility of soils under different treatments and conditions, G. J. Bouyoucos (*Michigan Sta. Tech. Bul. 44 (1919), pp. 3–49, figs. 7*).**—This bulletin describes investigations begun in 1917 on the rate and extent of the solubility of soils as determined by the freezing point method. Clay, clay loam, silt loam, sandy loam, and sandy soils were employed, and were subjected to different salt, fertilizer, and acid treatments accompanied by various moisture contents and temperatures. Untreated samples of a number of types of soil containing various amounts of organic matter and particles of different degrees of fineness were also studied. The moisture contents employed included an optimum and ratios of 1 of soil to 0.7 water, and of 1 of soil to 5 of water. Temperatures of below freezing, room temperature (about 20° C.), and 53° were used. The results may be summarized as follows:

Different classes of soil, with a water content of 1 of soil to 0.7 of water and kept at room temperature, when treated with N/10 salt solutions of $Ca(NO_3)_2$, $NaNO_3$, $KNO_3$, KCl, $K_2SO_4$, $(NH_4)_2SO_4$, $MgSO_4$, $KH_2PO_4$, $CaH_4(PO_4)_2$, and $NaC_2H_3O_2$ and then washed free of all soluble salts showed that the rate of solubility of all the salt treatments except $(NH_4)_2SO_4$ was slow and gradual, and that the process continued for a long time (120 days), but usually for about 50 days. In the case of $(NH_4)_2SO_4$ the initial velocity was quite rapid but soon slowed down. At the end of about 60 days there was an apparent constancy or equilibrium in the solubility. The extent of solubility at this point was found to be very appreciable in all the salt treatments and in all the soils, with few exceptions. All the soils except sand treated with $NaNO_3$, $KNO_3$, KCl, $K_2SO_4$, $(NH_4)_2SO_4$, $MgSO_4$, and $NaC_2H_3O_2$ yielded quite a large amount of material to solution, the depression in many cases rising from 0.005 to about 0.110° C. or from 125 to 2,750 parts per million of solution. The only salt treatments which did not cause a large solubility product were $Ca(NO_3)_2$, $KH_2PO_4$, and $CaH_4(PO_4)_2$, the depression in some of these treatments rising only from about 0.007° to 0.015° or from 175 to 375 parts per million. As a general rule $NaNO_3$ and $NaC_2H_3O_2$ in all the soils, except sand, tended to yield the greatest solubility product, $CaNO_3$, $KH_2PO_4$, and $CaH_4(PO_4)_2$ the smallest.

and $KNO_3$, KCl, $K_2SO_4$, $(NH_4)_2SO_4$, and $MgSO_4$ an intermediate product. In many soils $CaH_4(PO_4)_2$, and in a few cases, $Ca(NO_3)_2$ and $KH_2PO_4$ did not only give the smallest concentration but even a smaller concentration than the check, indicating that these salts have an indifferent or depressing effect upon the solubility of soils. As a whole it appeared that the phosphates tend to depress solubility and that they probably act as conservers of bases under field conditions.

"The result of solubility of these singly salt-treated soils goes to indicate that a salt or fertilizer treatment leaves a residual effect upon the soil, and this residual effect continues to be manifested in increased solubility and in increased crop-producing power. These data also go to indicate that the reaction between soils and salts seem to be chemical and not physical. In view of the different residual effects that the different salts or fertilizers have upon the solubility of soils and in view of many theoretical and practical considerations, the solubility factor can not be considered an absolute or reliable criterion for the state of fertility or crop-producing power of soils. In general, however, it can be said that a very heavily fertilized or extremely rich soil gives a greater solubility product than an unfertilized or poor soil."

Although the solubility attained a constancy at the end of about 60 days, this constancy is not believed to be a true equilibrium, the solution not being saturated when solubility ceases. This is said to be demonstrated by the fact that when different proportions of soil and water are employed an apparent equilibrium is attained in all the ratios, while the solubility product is not at all the same when the equilibrium is reached and does not become the same no matter how long the soil and water in the different ratios are kept in contact. Furthermore, considering the character of the soil, it is deemed extremely doubtful if true equilibrium can ever be attained in the soil solution. It is also stated that the solubility process of the soils would undoubtedly go on for a long time, probably almost indefinitely, in view of the extremely slow rate of solubility, if some factors did not intervene.

When different soils were treated with a combination of salts, including $Ca(NO_3)_2$, $NaNO_3$, $KNO_3$, KCl, $K_2SO_4$, $(NH_4)_2SO_4$, $MgSO_4$, $KH_2PO_4$, $CaH_4(PO_4)_2$ and $NaC_2H_3O_2$, and washed and kept under the same conditions as indicated above their rate of solubility was also slow, but the extent of solubility was very appreciable. The phosphates in this combination did not depress the solubility very markedly, but when $(NH_4)_2SO_4$ and $NaC_2H_3O_2$ were omitted the depression became more marked.

Experimental field soils from the Illinois, New York Cornell, Rhode Island, and Ohio Experiment Stations, which had been fertilized in the usual way, were washed and kept at a moisture content of 1 of soil to 0.7 of water and at room temperature. Their rate of solubility was very slow but their extent of solubility varied, being rather appreciable in some of them and quite small in others, and the variation failing to bear any close connection to the previous fertilizer treatment. These results were in general agreement with those of the single salt-treated soils. Even when these soils were kept at an optimum moisture content and placed outdoors under natural conditions, they failed to give a solubility product which bore a close relation to the previous fertilizer treatment, the rate of solubility being very slow and the extent of solubility quite appreciable but far smaller than that of the salt-treated soils.

Soils treated with $HNO_3$, HCl, $H_2SO_4$, $H_3PO_4$, $H_2C_2O_4$, $HC_2H_3O_2$, and $C_6H_8O_7$, washed, maintained at a moisture content of 1 of soil to 0.7 of water, and kept at room temperature showed a quite rapid rate of solubility, although the extent of solubility varied, being very small in the case of the inorganic acids, slightly higher with phosphoric acid, and quite appreciable with the organic acids.

In the untreated soils, which were washed, kept at room temperature, and at a moisture content of 1 of soil to 0.7 of water, both the rate and extent of solubility varied considerably between the different soils, there being no close and consistent relationship between the solubility factor and the class of soil, the organic matter content, and the fineness of particles. Practically the same results were obtained when an optimum moisture content was employed and the soils were kept outdoors under natural conditions, although in some soils more material went into solution when the moisture content was 1 of soil to 0.7 of water than when the moisture content was at optimum. There was a closer relationship on the whole between the solubility factor and the state of fertility or crop producing power of the soil with the former than with the latter.

When natural soils, previously washed, and with a moisture content of 1 of soil to 0.7 of water, were kept at a temperature of 53° their rate of solubility was somewhat appreciably increased. In some soils, however, these factors were not at all affected by the high temperature. The solubility of many soils even at this high temperature continued for a long time, even 60 days, but usually became constant at the end of about 30 days.

At the ratio of 1 of soil to 5 of water the rate of solubility of natural soils was also slow and the extent of solubility extremely small, the amount of material that went into solution at this water content being only about half as great as that at the water content of 1 of soil to 0.7 of water, although an apparent equilibrium was attained at this high water content, just as with the lower water content. Soils having a ratio of 1 of soil to 5 of water kept at 53° showed a slight increase in the rate and extent of solubility. The solubility product, however, was only about one-third as great as that of similar soils kept at the same temperature but having a ratio of soil to water of 1 to 0.7, while an apparent equilibrium was attained in the high ratio just as in the small ratio.

The results of experiments wherein were used a ratio of 1 of soil to 5 of water are held to indicate very strongly "that the concentration of the soil solution depends upon the relative masses of the soil and water and that the soil does not possess a definite solubility like definite compounds do. The amount of material that goes into solution seems to increase as the ratio of soil to water is increased up to about the optimum moisture content, and then it decreases."

**Relation of minimum moisture content of subsoil of prairies to hygroscopic coefficient**, F. J. Alway, G. R. McDole, and R. S. Trumbull (*Bot. Gaz., 67 (1919), No. 3, pp. 185–207*).—Soil moisture studies conducted for six years at the Nebraska Experiment Station are reported, in which samples of soils were used taken at a depth of 6 ft. or more from the buffalo-grass formation in the semiarid southwestern part of the State and from the prairie-grass formations in the eastern part of the State. The hygroscopic coefficient and the moisture content were determined for every sample and the moisture condition of the soil expressed as the ratio of moisture content to hygroscopic coefficient.

The subsoils of the semiarid prairies were characterized by their persistent dryness. Usually throughout more or less of the first 6 ft. a ratio of moisture content to hygroscopic coefficient of 1.5 or lower was found, and frequently a ratio as low as 1.1 was encountered in one or more of the foot sections.

After droughts of unusual severity the whole of the subsoil to a depth of 6 ft., and in some cases of 12 ft., showed a ratio of approximately 1. There was no appreciable further reduction of the moisture content when, after the subsoil had been reduced to this very dry condition, there followed a 4 or 5-month period of practically rainless autumn and winter weather. After such droughts the surface foot was but little drier than the subsoil.

The subsoils of the humid prairies, on the contrary, showed no distinct reduction of the moisture content through a greater depth than 5 ft., and even

in this a ratio as low as 1.2 or 1.3 appeared only under the severest drought conditions. The normal moisture condition in the deeper subsoil (6 to 20 ft.) appeared to correspond to a ratio between 2 and 2.4.

The dry condition of the deeper subsoil so common in the semiarid prairies is attributed to the presence of perennials with a vertical-root range of 15 ft. or more, while the moist condition characteristic of that of the humid prairies is regarded as evidence that the roots of the native vegetation are but little developed below the fifth foot. The occurrence of areas in the semiarid prairies even after a severe drought, in which the subsoil below the sixth foot is quite moist, is attributed to the absence or fewness of deep-rooted perennials in such places.

**Relation of soil moisture to orchard irrigation practice**, S. Fortier (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 7, pp. 361–367*).—The author presents data based largely on the work of the Irrigation Investigations Division of the Bureau of Public Roads, U. S. Department of Agriculture.

He points out that "the great need of arid soils in general and of orchard soils in particular is an abundant water supply and a larger percentage of organic matter. The effective water-holding capacities of soils should be determined in order to find out how much water to apply at each irrigation and how often to irrigate. Comparatively little moisture is drawn upwards through soils by capillarity. It is only where a water table is found within a few feet of the surface or where a body of free water comes in contact with the soil that this force is efficient in moving soil moisture. Gravity acts on capillary water as well as free water, and draws both downward unless a layer of hardpan or other impervious material intervenes. The expense of substituting the basin method for the furrow method may be saved providing the texture of the soil is improved by the addition of sufficient organic matter."

**Partial sterilization of soils and the influence of soil protozoa on their fertility**, G. Truffaut (*Génie Rural [1919], No. 89–90, pp. 22–24*).—The theory of the partial sterilization of soils is discussed and a summary of experiments is given, the apparent purpose being to place partial sterilization of soils on a practical large-scale working basis.

It was found in general that treatment of rich soils with carbon bisulphid at the rate of 445 lbs. per acre resulted in increases of crops of cabbage and onions of from 170 to 200 per cent. These tests were conducted on 5-acre plats. The use of such carbonaceous aromatic liquids as benzine, toluene, methylnapthalin, and anthracenic oils at the same rate produced crop increases of from 125 to 145 per cent. When these materials were used it was necessary to supply from 6 to 8 tons of water per acre. The use of carbonaceous solids at the rate of 223 lbs. per acre resulted in increases of from 130 to 160 per cent and were much more economical than the liquids.

Further pot and plat experiments with turnips showed the value of pure calcium sulphid when used at the rate of 445 lbs. per acre. However, decreases were noted if the calcium sulphid contained such impurities as zinc sulphid.

It is concluded in general that the partial sterilization of soils in both field and orchard is feasible.

**Soils**, W. A. Davis (*Ann. Rpt. Bd. Sci. Advice India, 1916–17, pp. 5, 6*).—Six years' field experiments on the economical use and effect of certain fertilizers on acid old alluvial soils of the Assam valley showed the paramount importance of adding basic material, preferably lime. Complete fertilizer mixtures were without effect unless the soil acidity was first neutralized. The necessary degree of neutralization of soil acidity varied with the crop and the soil.

Next to lime, phosphoric acid was found to be the limiting fertility factor in these soils. The best results were obtained from basic slag, rock phosphate,

and other basic phosphates. The continued use of superphosphate or ammonium sulphate on these soils when unlimed was unprofitable and the constant use of ammonium sulphate even on limed soil was unprofitable.

Chemical analyses and fertilizer experiments on indigo soils of Bihar showed that the limiting fertility factor of these soils is phosphoric acid.

A soil survey in Bengal indicates that the red laterite soils of the old alluvium in eastern Bengal are deficient in lime and phosphoric acid and contain relatively large amounts of potash, which is, however, practically unavailable until lime has been added. The new alluvial soils are more productive than the lateritic soils and are rich in total potash, but relatively deficient in phosphoric acid.

**Investigational work with fertilizers,** F. T. SHUTT (*Canada Expt. Farms Rpt. 1918, pp. 17, 18*).—Plat experiments begun in 1915 with truck crops, grain, and hay at five of the experimental farms are reported.

"Prominent features noted in the results from the individual stations include the very decided influence of phosphoric acid at Charlottetown, where it proved the limiting fertilizer factor. By increasing the quantity of phosphatic fertilizer applied, the profitable use of larger nitrogenous applications was permitted, whereas, with inadequate phosphoric acid, an increase in the amount of nitrogen proved ineffective. On the light, sandy loam soil at Kentville, the plats with manure and fertilizers produced yields superior to those from either manure or fertilizers alone. At all the stations the combinations of manure and fertilizers ranked highly and took highest place in the averages. At Fredericton, the heaviest fertilizer applications were found both most productive and most profitable."

"The average profit, for the three years, from the plats receiving both manure and fertilizers was over $30 per acre, while the average profits from fertilizers alone during the same period was slightly over $15 per acre."

Further experiments at the five stations proved sodium nitrate to be superior to ammonium sulphate as a source of nitrogen, and at four of the stations showed acid phosphate to be superior to basic slag or bone meal. Calcium nitrate was found to be as effective as sodium nitrate or ammonium sulphate as a source of nitrogen.

Experiments with a chemically treated peat from England showed no evidence of any appreciable fertilizing value.

**The synthesis of ammonia at high temperatures, III,** E. B. MAXTED (*Jour. Chem. Soc. [London], 115 (1919), No. 676, pp. 113–119, fig. 1; abs. in Jour. Soc. Chem. Indus., 38 (1919), No. 7, p. 219A; Sci. Abs., Sect. A—Phys., 22 (1919), No. 258, p. 296*).—Previous results (E. S. R., 39, p. 817) were confirmed in the experiments here reported, which were made with larger arcs than were used in the earlier experiments. It was found that rapid flow of gas through the apparatus caused a considerable decrease in the percentage of ammonia produced. The results showed that there was direct synthesis of the ammonia and indicate that oxygen plays no part in the process.

**Sodammonium sulphate. A new fertilizer. The utilization of niter cake in the fixation of ammonia,** H. M. DAWSON (*Jour. Soc. Chem. Indus., 38 (1919), No. 8, pp. 98T–101T, fig. 1*).—The chemistry involved in the process of manufacture of sodammonium sulphate is discussed, in which niter cake is used for the absorption of ammonia as a substitute for sulphuric acid.

Preliminary pot experiments with mustard showed that the fertilizing value of sodammonium sulphate, when added to a dressing of calcium carbonate and potassium phosphate, is approximately the same as that of ammonium sulphate containing the same amount of nitrogen.

"Available agricultural data thus afford strong evidence in favor of the suitability of sodammonium sulphate as a fertilizer. Its production from niter cake or other acid sodium sulphate represents a very simple process, for the carrying out of which on the large scale the only plant required consists of evaporating pans and crystallizing tanks in addition to the saturators. On the assumption that niter cake is available at a comparatively low price, the cost of fixation of ammonia by the sodammonium process may be expected to be very much smaller than by the ordinary sulphuric acid process."

**Availability of the nitrogen in garbage tankage**, F. E. Bear and G. Walley (*Mo. Bul. Ohio Sta., 4 (1919), No. 6, pp. 191, 192*).—In a contribution from the department of agricultural chemistry and soils, Ohio State University, the authors describe observations on the availability of the nitrogen in garbage tankage from the Municipal Reducing Plant of Columbus, by means of the alkaline permanganate method and by nitrification tests. The results are held to indicate that nitrogen from this source is only very slowly available, requiring liberal applications for marked results.

**Study of nitrification of leather and oil cake**, R. Guillin (*Bul. Soc. Agr. France, 1917, Dec., pp. 357–360, fig. 1*).—Comparative studies of the nitrification of dried blood, tanned leather, chrome leather, burnt leather, leather dissolved in sulphuric acid, and oil cake in a calcareous clay soil showed an increase in nitrate in all cases except where the chrome leather was used, in which case there was a marked decrease in nitrate.

Pot experiments with wheat in which chrome leather and dissolved leather were added showed that considering the weight of the crop obtained from the unfertilized soil as 100 the weight of crop where chrome leather was used was only 30, indicating an injurious effect of the chrome leather. The crop was increased to 115 where dissolved leather was used, showing that this has some fertilizing value.

It is concluded that chrome leather has no fertilizing value and that furthermore it is injurious to crops. Neither tanned or burnt leather are considered to have much fertilizing value, while the value of dissolved leather is considered to be relatively high. No marked difference was noted between dissolved leather in liquid or pasty conditions.

**The peat deposits of Minnesota**, E. K. Soper (*Univ. Minn., Geol. Survey Bul. 16 (1919), pp. IX+261, pls. 21, figs. 9; abs. in Jour. Amer. Peat Soc., 11 (1918), No. 4, pp. 227–243, figs. 8*).—This is a report of a survey of the peat deposits of Minnesota, from which it is estimated that Minnesota had originally about 7,000,000 acres of peat land containing peat deposits varying in thickness from a few inches to 30 ft. or more. Of this area about 5,217,000 acres are covered with peat at least 5 ft. thick. The deposits as a whole vary in thickness from a few inches to 63 ft.

The following types of peat are recognized: (1) Deposits which represent filled lakes or ponds; (2) deposits representing accumulations built up on moist depressions, or flat, undrained areas; (3) deposits which represent combinations of types 1 and 2 which consist of lake or pond peat, in the lower portion, and swamp, of sphagnum peat, above; and (4) deposits which occur on flats and lowlands along river valleys.

The prevailing color of Minnesota peat is brown. The commonest texture is fibrous or mossy.

Chemical analyses of 29 samples of typical peat are reported, the most noteworthy features of which are the high average nitrogen content and the comparatively low ash content. These are considered to indicate peat of excellent

quality for fuel. The largest and best peat deposits, for fuel especially, are all in the northern part of the State.

Peat, P. GUIEU (*La Tourbe. Paris: Libr. Garnier Frères, 1918. pp. VII+219, figs. 55*).—This book deals with the origin and composition of peat and with methods of securing it commercially and its commercial treatment and utilization. Special chapters deal with the uses of peat as fuel and in agriculture. In the former use peat is burned directly or utilized for gas production. The section on the agricultural use of peat discusses its use as litter and as a fertilizer filler and also as a material used in the manufacture of nitrates.

**A reconnaissance of the Uinta Mountains, Utah, with reference to phosphate**, A. R. SCHULTZ (*Amer. Fert., 51 (1919), No. 5, pp. 64–67, 96, 98, 102, 104, 108, 110, 114, 116, 118, 120, 122, 125, fig. 1*).—This report deals with the geology and mineralogy of an area of approximately 6,000 square miles in northern Utah, with special reference to the quantity and quality of phosphate present.

"Throughout the Uinta Mountain uplift the entire phosphatic series, which constitutes only a part of the Park City formation, is approximately 35 ft. thick and varies from place to place. In this formation there is a single phosphatic zone in which the beds of phosphate, thick and thin, rich and lean, occur. Some of the beds several inches in thickness consist almost entirely of phosphatic material; others are composed chiefly of chert nodules and lenses with a little phosphate material. The thicker beds consist of cherty limestone, shale, sandstone, and phosphate beds from 1 to 6 ft. in thickness. Individual layers or beds in this series contain more or less phosphatic salts ranging from 1 to 70 per cent tricalcium phosphate, the maximum being equivalent to 32 per cent phosphoric acid."

**The fertilizing action of bone meal phosphate**, C. BEGER (*Landw. Vers. Stat., 88 (1916), No. 3–4, pp. 291–304*).—Pot culture experiments with mustard to compare three different types of bone meal, containing respectively 32.1, 23.3, and 21.3 per cent phosphoric acid, with Thomas slag meal and dicalcium phosphate are reported.

The Thomas meal gave the best results, followed in order by the dicalcium phosphate and the bone meals. The bone meals acted much more slowly than the Thomas meal or the dicalcium phosphate, but gave better relative results in larger additions. The results with the bone meals were so near to those with the other phosphates that it is thought that where necessary they will make suitable substitutes.

**Our natural resources of potash**, F. W. BROWN (*Mining and Sci. Press, 117 (1918), No. 23, pp. 759–762*).—The author reviews the potash resources of this country, including by-products of cement manufacture and of blast furnaces, wool and wood wastes, alunite, lake brines, and kelp. The Pacific coast kelps are considered the most hopeful source of potash at present.

**The nature of the recombined potash in cement mill dust**, A. R. MERZ and W. H. ROSS (*Jour. Indus. and Engin. Chem., 11 (1919), No. 1, pp. 39–45*).—Studies at different cement mills are reported.

It was found that "the water soluble potash in cement dust owes its source (1) to the volatilization of potash in the burning of the cement, (2) to the decomposition of potash silicates of the raw mix carried over mechanically in the dust, and (3) in the case of coal-fired kilns, to the ash of the coal which may yield up a portion of its potash through the action of the lime in the dust. The first-mentioned source is ordinarily much the most important. The water-insoluble but acid-soluble potash of cement dust is due (1) to a recombination of a portion of the volatilized potash with the ash of the coal used for fuel, (2) to a recombination to a much smaller extent, and only under certain

conditions, with the siliceous material originally occurring in the raw mix, and (3) to a partial decomposition of the silicates of the raw mix and also of any coal ash which is carried over mechanically in the dust. The acid-insoluble potash in cement dust is due to undecomposed silicates and coal ash carried over mechanically in the dust, and to a recombination of the volatilized potash with the ash of the coal when the amount volatilized is low.

"The portion of the potash in the dust which has undergone recombination is of the nature of a potash slag or impure glass. When the amount of potash volatilized is low, and particularly in the presence of carbon, some recombination may take place with the siliceous material of the raw mix as well as that of the ash. It is probable that the extent of the recombination would be reduced if the burning of the cement were done under oxidizing rather than reducing atmospheric conditions. The extent of recombination would also probably be reduced by any procedure that would introduce lime or sodium chlorid into the dust at the hottest part of the kiln. The greater the amount of potash volatilized, the lower will be the proportion that will undergo recombination in the dust."

**German potash industry during the war,** P. L. Edwards (*U. S. Dept. Com., Com. Rpts., No. 213 (1919), pp. 1331–1333*).—This report indicates that the production of potash salts in Germany during the war was not so abnormally low as was generally believed, due to increased domestic consumption and exports to the allies of Germany. The total productions of crude potash in 1915, 1916, and 1917 were 7,567,424, 9,507,176, and 9,832,612 short tons, respectively, as compared to 12,768,262 short tons in 1913. During 1917 Germany used 917,820 tons of actual potash in agriculture as compared to 589,713 tons used in 1913, and during 1917 a total of 1,056,929 tons of German potash was used in agriculture.

**Fertilizer experiments with increasing amounts of potash on lowland moor soils with cabbage and potatoes, I–II,** A. J. Werth (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 36 (1918), Nos. 17, pp. 305–310; 18, pp. 317–321, fig. 1*).—Plat experiments with cabbage and potatoes on lowland moor soils, in which 26 and 40 per cent potash salts were added at rates of 243, 486, 729, and 972 lbs. per acre, are reported. The purpose was to determine the most efficient additions of potash salts on these soils.

The addition of 486 lbs. of 40 per cent salts per acre to cabbage did not give the highest yield. The addition of 729 lbs. materially increased the yield, and in some cases the highest yield was obtained with the 972-lb. addition. It is thought that a residual effect may be expected from the constant potash fertilization of such moor soils, but the effectiveness of greater additions than those noted is considered doubtful.

With potatoes additions of 324 to 405 lbs. per acre of 40 per cent salts did not give maximum results. It is thought that additions of 486 to 567 lbs. of 40 per cent salts or 648 to 729 lbs. of 26 per cent salts will give better results generally, but a depression is noted for greater additions. Even though a depression in crop occurs it is thought that the residual effect of larger additions will be compensating.

**The injurious effects of potash and sodium salts upon the soil structure and their cause,** G. Hager (*Jour. Landw., 66 (1918), No. 4, pp. 241–286, fig. 1*).—Experiments on the effect of potash and sodium salts on soils are reported in which it was found that weak acids have a tendency to split off the combined bases in soils as hydrates. The bivalent cations, lime and magnesium, have a favorable influence on the soil structure, while the monovalent, sodium and potassium, have an unfavorable influence.

It is concluded then that the action of alkali salt solution, such as sea water on soils, is one resulting in the displacing of the calcium and in less measure the magnesium compounds by the alkalis. The presence of salts with the same cation in the soil solution was found to interfere with the hydrolysis and the consequent splitting off of the alkali hydrate. With the disappearance of alkali salts with the common ion, hydrolysis of soil zeolites set in and alkali hydrates were found in the soil solution as shown by displacement of the salt solution by washing. Sodium salts had a more injurious influence than potassium salts, which is attributed partly to a greater power to dissolve humus considered as a protective colloid.

Permeability experiments using potassium permutit and sodium permutit gave the same results as the alkali chlorid solutions by displacing these solutions in soils with water. The permeability of the soil was markedly reduced, and the drainage water was brown and contained considerable clay. The alkalinity was high, and the sodium compound gave the most marked results. Addition of a 0.5 per cent solution of common salt stopped the unfavorable action of the sodium permutit, proving the theory noted above.

**The comparative value of various forms of limestone,** R. STEWART and F. A. WYATT (*Soil Sci., 7 (1919), No. 4, pp. 273–278*).—Four years' experiments on 114 plats and 14 years' experiments on 64 plats, conducted by the Illinois Experiment Station to compare high calcium and dolomitic limestones on acid soils, are reported.

It is concluded that "for the common farm land of acid regions, an application of 1 ton per acre of limestone once in 3 or 4 years is sufficient to keep the soil alkaline, or sweet, after the initial acidity has been destroyed by heavier applications. Dolomitic limestone can be used successfully on acid soils. It is slightly more effective than high-calcium limestone in neutralizing the soil acidity, is more durable, and has no injurious effects on the crop yields. . . . There is no evidence that finely ground limestone is more effective in correcting soil acidity than is the total product from a ¼-in. screen, which contains both the finer material for immediate use and the coarser material for greater durability. . . .

"Limestone applied to the surface slowly penetrates into the subsurface. This process, however, requires considerable time. On the Odin field after 14 years, one-half the acidity in the subsurface was neutralized where the larger applications had been made to the surface, and one-fourth where the lighter applications had been made. Applications of limestone to the surface soil seem to have no effect upon the acidity of the subsoil. The amount of native limestone found in the subsoil is a variable quantity. In some cases there is none present even at a depth of 40 in., whereas in other cases it extends upward even slightly into the subsurface. . . .

"The annual loss of limestone is not so large as generally assumed. As an average of all determinations, the annual loss from the surface 20 in. was 760 lbs. per acre from the Newton field and 542 lbs. per acre from the Odin field. A study of the total calcium indicates that the actual loss of bases may have been less than is shown by these figures, which are based upon the carbon dioxid and acidity determinations. It is very evident from the data presented that chemical analysis may be depended upon to measure the acidity in the soil, the reduction in acidity due to the action of limestone applied, and also to find the limestone still remaining in the soil, whether from applications made or from a supply native to the soil."

**Results of liming experiments by the Finland Moor Culture Society,** A. RINDELL (*Jahrb. Moork., 3–5 (1914–1916), pp. IX–XXVI*).—A number of liming

experiments on different moor soils with various field and truck crops are reported.

In most cases liming of moor soils resulted in a decrease in crop yields, or at least no increase. Where upland moor soils were mixed with normal loam soils, the beneficial effect of liming was very small and variable. However, when the loam soil contained injurious iron sulphur compounds liming gave very beneficial results. It was found that the injurious acidity of upland moor soils could be neutralized to better advantage by adding normal loam soils than by liming.

**The ammonia-fixing capacity of calcium sulphate,** F. E. Bear and A. C. Workman (*Soil Sci., 7 (1919), No. 4, pp. 283–291, fig. 1*).—Experiments conducted at the Ohio State University are reported on the power of calcium sulphate to fix ammonia from pure ammonium carbonate.

It was found that calcium sulphate will prevent to a certain degree the loss of ammonia from a mixture containing volatile ammonium carbonate, and it is considered quite probable that the loss prevention is due to the formation of nonvolatile ammonium sulphate by the double decomposition of ammonium carbonate and calcium sulphate. The ammonia-fixing capacity of calcium sulphate was found to be apparently dependent on the temperature. The quantity of ammonia given off by the ammonium carbonate increased as the temperature rose and the percentage of it held by the calcium sulphate decreased.

**The effect of manganese on the growth of wheat: A source of manganese for agricultural purposes,** J. S. McHargue (*Jour. Indus. and Engin. Chem., 11 (1919), No. 4, pp. 332–335, figs. 4*).—Pot and water culture experiments with wheat conducted at the Kentucky Experiment Station to demonstrate the effect of manganese on the growth of wheat and studies to determine a source of this element are reported.

It was found that manganese in suitable dilution stimulated the growth of wheat, increased the size and nitrogen content of the grain, and apparently performed an important function in the normal growth and development of the plant.

Chemical examinations of a number of different agricultural limestones, raw rock phosphate, and basic slag showed that the first two materials contained very little manganese, but that basic slag contains about 100 lbs. of manganese to the ton. "It is possible that some of the benefit to crops resulting from the use of this fertilizer, on certain soils, may be due to this element."

## AGRICULTURAL BOTANY.

**Plant succession in relation to range management,** A. W. Sampson (*U. S. Dept. Agr. Bul. 791 (1919), pp. 76, pls. 6, figs. 22*).—A study has been made in the Manti National Forest in central Utah of means for detecting possible overgrazing of ranges, and the author points out what plants may be considered reliable indicators of overgrazing in the various types and how they may be used as guides in revegetation and the maintenance of the forage crop. A list of the most typical primary and secondary species of the respective covers in this region is appended.

He believes that the character of the native vegetation can be used as a reliable indicator of the condition of the range and of the effect on the plant cover of a given method of grazing. It is claimed that if the invading plants are lower in the succession than the predominating vegetation, the range is being utilized unwisely in one or more respects. If the incoming vegetation is somewhat higher successionally than the type as a whole, improvement under the

management in vogue is sure to follow. Where the negative indicators are crowding out the more permanent and desirable species, remedial measures should be adopted with a minimum loss of time. Since range depletion is due chiefly to too early cropping or to overgrazing, the application of the deferred-and-rotation grazing system, coupled with a correct estimate of the carrying capacity of the range, may be relied upon fully to revegetate the lands where enough plants of desirable species are found for seed production.

**Botanical survey [in India]**, H. G. CARTER (*Ann. Rpt. Bd. Sci. Advice India, 1916–17, pp. 32–34*).—This contains an account of studies extending the lists of known plants in portions of India, with notices of recent publications on certain groups.

**Agricultural botany [in India]**, A. HOWARD (*Ann. Rpt. Bd. Sci. Advice India, 1916–17, pp. 35–43*).—A discussion of this phase of economic botany includes, besides mention of technical publications, reports on the improvement of crops, among them cotton, rice, sugar cane, wheat, jute, indigo, fruit, and chilies. Root nodules and soil aeration also receive notice.

**Forest botany [in India]**, R. S. HOLE (*Ann. Rpt. Bd. Sci. Advice India, 1916–17, pp. 44–46*).—This report, which is complementary to that noted above, deals with soil aeration, forest grasses, sissoo (*Dalbergia sissoo*), root disease (*Fomes lucidus*) and spike disease of sandal, with mention of descriptive lists and papers on the systematic botany of this region.

**Evolution through normal diversity**, O. F. COOK (*Jour. Wash. Acad. Sci., 9 (1919), No. 7, pp. 192–197*).—The author makes reference to a paper by Meehan published in 1894 (E. S. R., 6, p. 389) in which attention is called to observations by himself, confirming his records extending back about 25 years and tending to show that there is in the plant in question (*Impatiens fulva*) innate power to vary coexistent with the species itself, independent of any conditions of environment. This definite recognition of normal diversity is referred to on account of the historical interest. Diversity being accepted as a normal and general condition in species, evolution is seen as a process of integration and differentiation of characters, the two essential conditions of evolutionary progress being normal diversity (heterism) and free intercrossing of lines of descent (symbasis).

**The symbiomorphoses; recent studies on asexual hybridization**, L. DANIEL (*Rev. Gén. Bot., 30 (1918), No. 359, pp. 367, 368*).—In the résumé of this work by L. Defour, it is stated that the author has given attention to certain modifications of plants observed to arise in consequence of grafting. These have been called symbiomorphoses, of which two classes or cases are distinguished, namely those arising when different genera or species are grafted and those arising when grafts are made between varieties. The author reaches the general conclusion that in a given graft one may encounter variations of diverse origin. These symbiomorphoses are almost always resultants of numerous factors which may be physical, chemical, or physiological in character.

It is considered as impossible at present to distinguish the precise action of this or that morphological or genetic factor on account of the extreme complexity of the result.

Underground runners, E. WARMING (*K. Danske Vidensk. Selsk. Skr., Naturvidensk. og Math. Afd., 8. ser., 2 (1918), No. 6, pp. 295–378, figs. 43*).—This contribution contains a definition and discussion of several types which are distinguished of plagiotropic shoots.

Natural grafting of branches and roots, W. DALLIMORE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 9–10 (1917), pp. 303–306, pls. 2*).—Examples of natural grafting occurring in cases observed, either above or below the surface

of the ground are given with suggestions or explanations regarding the processes involved.

**Cross-inoculation of legumes**, G. P. Koch and J. R. Butler (*Soil Sci., 6 (1918), No. 5, pp. 397–403*).—Reporting data from cross-inoculation tests dealing with several common legumes, the authors state that *Bacillus radicicola* isolated from roots of alfalfa, sweet clover, and bur clover all cross-inoculated, although but slight infection followed inoculation of bur clover (roots) with organisms from alfalfa and sweet clover. Organisms from either red, white, crimson, or alsike clover inoculated upon any other of these showed normal vigor. Cross-inoculation succeeded (showing a difference in vigor, however) between vetch, sweet pea, garden pea, and Canada field pea. In nearly all cases organisms from the cowpea group cross-inoculated successfully.

**Potassium requirements of bacteria**, G. P. Koch (*Soil Sci., 5 (1918), No. 3, pp. 219–224*).—This information has already been noted (E. S. R., 39, p. 619).

**On the occurrence, behavior, and origin of a smooth-stemmed form of the common foxglove (Digitalis purpurea)**, E. R. Saunders (*Jour. Genetics, 7 (1918), No. 3, pp. 215–228*).—The author has continued through several generations a study of some peculiarities observed in work previously noted (E. S. R., 25, p. 229). She states that besides the form which is now considered as the type *D. purpurea pubescens* another form exists and this is designated as *D. purpurea nudicaulis*. This resembles the type in all but surface characters, which are described with a discussion of their possible significance.

**The purple hyacinth bean**, G. F. Freeman (*Bot. Gaz., 66 (1918), No. 6, pp. 512–523, figs. 7*).—Concluding his presentation and discussion of opinion and evidence, the author sustains the designation by Linnaeus of the common annual (in the tropics perennial) hyacinth bean as *Dolichos lablab*, and the more slender climber (in northern climates perennial) as *D. lignosus*.

**The effect of certain organic substances on seed germination**, E. B. Fred (*Soil Sci., 6 (1918), No. 5, pp. 333–349, figs. 10*).—Experiments conducted at the Wisconsin Experiment Station, in which alfalfa, casein, peptone, and sugar were added in varying amounts to silt loam soil in which alfalfa, buckwheat, castor bean, red clover, corn, cotton, flax, hemp, white lupine, mustard, oats, serradella, soy bean, sunflower, sweet pea, and wheat seeds were planted, are reported.

It was found that nitrogenous substances such as alfalfa powder, casein, and peptone did not seriously injure seed germination unless used in very large quantities. As compared with green manure (nitrogen content), very large amounts of casein and peptone were required to cause a noticeable decrease in germination. Calcium carbonate apparently did not lessen the decrease in germination due to very large applications of alfalfa powder or casein. Sugar greatly increased bacterial growth and retarded the rate of seed germination. In large amounts it decreased the percentage of germination. Soil sterilization often inhibited the rate of seed germination.

**Difference in the action of radium on green plants in the presence and absence of light**, C. Packard (*Jour. Gen. Physiol., 1 (1918), No. 1, pp. 37, 38*).—Tests carried out with Spirogyra and Volvox exposed to radioactivity are said to have shown that the life of the cell is longer under such exposure in light than in darkness, being prolonged apparently by some condition connected with photosynthesis.

**On the dynamics of photosynthesis**, W. J. V. Osterhout and A. R. C. Haas (*Jour. Gen. Physiol., 1 (1918), No. 1, pp. 1–16, figs. 5*).—The authors describe (with a discussion of results) a study of sea lettuce (*Ulva rigida*) carried on during August in order to obtain data for the study of the dynamics of photosynthesis. They have developed a method of investigation based on the

fact that as plants abstract carbon dioxid from a solution the latter becomes more alkaline. Minute amounts of photosynthesis in marine plants can be measured accurately by adding a little phenolphthalein to the sea water and observing the color changes. By this method it was found that Ulva after being kept in darkness begins photosynthesis as soon as it is exposed to sunlight, and the rate steadily increases to a constant value.

**A method of studying respiration**, W. J. V. Osterhout (*Jour. Gen. Physiol., 1 (1918), No. 1, pp. 17–22, fig. 1*).—Apparatus is described by which small amounts of carbon dioxid given off by organisms can be measured rapidly and accurately. The apparatus can be employed also to measure photosynthesis.

**An indicator method of measuring the consumption of oxygen**, W. J. V. Osterhout (*Jour. Gen. Physiol., 1 (1918), No. 2, pp. 167–169*).—The author describes a method of measuring oxygen consumption employing the blood of the horseshoe crab (*Limulus* sp.). This absorbs oxygen and turns blue when shaken in air, but is quickly decolorized in the presence of certain organisms which consume oxygen. By measuring the time required for the change of color the rate of consumption of oxygen (by animal or plant) may be determined. This method is employed in some of the series below.

**Comparative studies on respiration, I–V** (*Jour. Gen. Physiol., 1 (1918), No. 2, pp. 171–220, figs. 17*).—Five papers are presented.

I. *Introduction*, W. J. V. Osterhout (pp. 171–179).—The author describes the first of a series of investigations on respiration in plants (which is in some cases compared with that of animals), employing improved quantitative methods dealing with representatives of bacteria, higher fungi, algæ, and flowering plants. It is shown that when anesthetics are employed in sufficient concentration to produce any result, plants show a rise in the rate of respiration followed by a decline. In animals the rise (found in higher concentrations only) was preceded by a temporary fall not entirely due to lowering of muscular activity or tonus. In lower concentrations the effect was merely a decrease of respiration. The results of all the investigations are opposed to the theory of Verworn, namely, that anesthesia is a kind of asphyxia due to the checking of respiration by the anesthetic.

II. *The effect of anesthetics and other substances on the respiration of Aspergillus niger*, F. G. Gustafson (pp. 181–191.—In this investigation, which was undertaken to compare the action of anesthetics and other substances on the respiration of a fungus (*A. niger*) with effects produced in other groups of organisms, it was found that in effective concentrations formaldehyde, ether, and acetone first increased and later decreased the rate of respiration. Ether at 3.65 per cent caused an increase with certain cultures, a decrease with others. The reaction producing an increase in the respiration with 7.3 per cent ether is reversible, the reaction producing the decrease irreversible. Caffein at 0.5 per cent produced only a decrease in respiration. A saturated solution caused an increase, which was followed by a decrease.

III. *The effect of ether on the respiration and growth of Bacillus subtilis*, M. M. Brooks (pp. 193–201).—It was found that all concentrations of ether employed (from 0.037 to 7.3 per cent) caused an increase in the rate of respiration of *B. subtilis*, followed by a decrease. Ether at 7.3 per cent in tap water gave an extraordinary increase (50 times the normal) in the output of carbon dioxid. This increase did not occur when 0.85 per cent sodium chlorid was added. At lower concentrations (0.037 to 1.1 per cent) ether was toxic, and the same was true at higher concentrations (3.65 to 7.3 per cent), while intermediate concentrations stimulated growth.

IV. *The effect of ether on the respiration of wheat*, H. S. Thomas (pp. 203–207).—The experiments here described show that 7.3 to 3.65 per cent ether

solutions caused an increase in the respiration of wheat, followed by a decrease. These results agree with those of Haas and of Gustafson (above noted), but not with the theory of Verworn.

V. *The effect of ether on the production of carbon dioxid by animals*, M. Irwin (pp. 209–220).—The purpose of this investigation was to make a comparison of the carbon dioxid output of animals with that of plants under the influence of a typical anesthetic such as ether. The results are considered to show that narcosis is not due to asphyxia, and that the action of anesthetics is not due to their effect on respiration. While in the case of animals the increase in carbon dioxid output is accompanied by irreversible change leading to death, this is not necessarily the case in plants. The reversible (narcotic) action of ether on the animals studied was accompanied by a decrease in carbon dioxid output, while this was not ordinarily the case with plants.

The interpretation of the facts observed is considered to require further investigations.

Analytic and synthetic studies on chlorophyll. A. and A. Mary (*Études Analytiques et Synthétiques sur la Chlorophylle. Paris: A. Maloine & Sons, 1917, pp. 40, pl. 1*).—This contribution discusses, first, the views of other authors mentioned in regard to characters and properties of chlorophyll; second, spectrum analysis as applied in the study of chlorophyll; third, its chemical relations; fourth, its behavior toward coloring substances (methylene blue); fifth, a comparative study of chlorophyll pigment with anilin; and sixth, the functions of chlorophyll.

Growth rates in plants, O. Debatin (*Naturw. Umschau Chem. Ztg., 5 (1916), No. 4, pp. 52–54*).—Rates of growth or of doubling (dimensions) are given with discussion for a number of higher and lower plants.

Abnormal stem growth of soy beans in sand cultures with Shive's three-salt solution, A. G. McCall, J. B. S. Norton, and P. E. Richards (*Soil Sci., 6 (1918), No. 6, pp. 479–481, pls. 2*).—The authors refer to the observations and data reported by Shive (E. S. R., 39, p. 827), in whose work each of the phosphates used singly in the soil cultures caused specific injury to soy beans when the initial concentration of the solution was above 1 atmosphere (monopotassium phosphate producing the least and monocalcium phosphate the most injury). They state that in their study during two years, soy beans growing in sand cultures, supplied with Shive's 3-salt nutrient solution having a concentration initially of 1.75 atmospheres, showed injury in case of widely varying salt proportions. It is suggested that this injury, instead of being correlated with a high concentration of a particular salt, may have resulted from some property which was common to all of the Shive 3-salt solutions.

Osmotic pressure in plants on mountain heights, O. Arrhenius and E. Söderberg (*Svensk Bot. Tidskr., 11 (1917), No. 3–4, pp. 373–380*).—A study of mountain plants carried out during the summer of 1917 at a point in Swedish Lapland and is said to show that these have a relatively high osmotic pressure (corresponding to the concentration of the cell sap), which within certain limits protects the plants against frost injury.

Distribution of materials dissolved in the sap in different portions of the stalk of sugar cane, J. Kuijper (Kuyper) (*Arch. Suikerindus. Nederland. Indië, 26 (1918), No. 39, pp. 1665–1686; also in Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 11 (1918), pp. 22*).—It is stated that the amount of dissolved substance increases with considerable regularity from the top of the cane downward, and generally from the central part outward, the harder parts thus containing larger percentages of solutes.

Some observations on the behavior of turgescent tissue in solutions of cane sugar and of certain toxic substances, D. Thoday (*New Phytol., 17 (1918), No.*

*3–4, pp. 57–68, figs. 8*).—Experiments herein described were suggested by observations reported by Brown, both alone and in connection with Worley and with Tinker (E. S. R., 34, p. 626), and his results are said to have been made available at this time on account of the appearance of data contributed by Stiles and Jörgensen (E. S. R., 39, p. 223). Pieces of potato tubers were immersed in cane sugar solution and in solutions of mercuric chlorid, osmic acid, mercuric cyanid, or chloroform for different periods of time, and the resulting data are presented with discussion which is to be continued in a more general form in a later paper.

**The law controlling the quantity of regeneration in the stem of Bryophyllum calycinum,** J. Loeb (*Jour. Gen. Physiol., 1 (1918), No. 1, pp. 81–96, figs. 5*).—This is in review and continuation of communications previously noted (E. S. R., 40, p. 224).

A method is noted of measuring the influence of the mass of a leaf of *B. calycinum* on the quantity of shoots regenerated in an isolated piece of stem. The method consists in isolating a section of stem with only two leaves at the basal node and splitting the stem lengthwise into symmetrical halves, each piece containing one of these leaves, one dormant shoot bud, and two half buds. By reducing the size of one of the sister leaves, the influence of leaf mass on shoot regeneration by the stem can be measured.

It is stated that the mass of shoots regenerated at the apical bud increases under like conditions and in equal times in proportion to the mass of the leaf, whether the latter be intact or mutilated. The assumption that growth occurs at the expense of the material furnished by the basal leaf is supported by the fact that in the dark the influence of the leaf disappears more or less completely, and that the attached leaf loses greatly in weight. A certain tendency to wilt, however, interferes more or less with the almost perfect proportionality observed under favorable conditions.

The material furnished by the leaf includes, presumably, both water and solutes. The mass of shoots regenerated by a piece of stem without leaf is so small as to be almost negligible when compared with the mass of shoots produced by a like piece of stem when a leaf of sufficient mass is left attached to its base.

**A consideration of certain pathologic conditions in Ambrosia trifida.** A. Stewart (*Amer. Jour. Bot., 6 (1919), No. 1, pp. 34–46, pl. 1, fig. 1*).—A further study of the great ragweed *A. trifida* (E. S. R., 35, p. 651) in regard to the effects of the disturbance caused by stimuli due to wounding or to attacks by animals or plant parasites, or a combination thereof, is discussed in some detail. It appears that, while wound stimulus is much more powerful than fungus gall stimulus (causing more extensive changes), that due to the presence of the fungus is able to overcome that due to insect attack, when the two occur in the same portion of the plant.

**The nature of charred wood,** L. A. Boodle (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 9–10 (1917), pp. 306–308*).—Noting the results of experiments bearing upon the nature of the residue of pine or other woods charred by heat or sulphuric acid or both, the author states that a product was obtained by him which differed from typical charcoal in its behavior toward oxidizing agents, a series of degrees of resistance being obtainable evidently bearing a relation to the severity of the charring process. The general conclusion reached is that in certain cases charred wood contains no free carbon unless it is in a condition differing from that of ordinary carbon.

## FIELD CROPS.

**American husbandry, a much overlooked publication,** L. Carrier (*Jour. Amer. Soc. Agron., 11 (1919), No. 5, pp. 206–211*).—The author briefly reviews a 2-volume treatise on American agriculture issued in London in 1775 under authorship of "An American", and believed to be the work of John Mitchell. The publication is said to deal with the soil, climate, and agricultural practices and products of the English colonies in America, including Nova Scotia, Canada, New England, New York, New Jersey, Pennsylvania, Maryland, Virginia, the Carolinas, Florida, and the West Indies, and to have been written largely for use in England rather than in America. The books are believed to be of considerable value both from an agricultural and historical point of view.

**[Report of field crops work in Florida, 1918],** J. M. Scott, B. F. Floyd, J. E. Turlington, and J. B. Thompson (*Fla. Sta. Rpt. 1918, pp. 23–26, 38–39, 84–93, figs. 5*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 39, p. 434).

Replanting Japanese cane in 1915 on variously fertilized plats which had grown the crop since 1909 resulted in yields of green material ranging from 18 tons per acre for the plat receiving dried blood and acid phosphate to 31.9 tons for that receiving muriate of potash and acid phosphate. A decided decrease in yield occurred on all plats in 1916 and a still greater decrease in 1917. Fertilizer experiments with Japanese cane begun in 1914 resulted in an average maximum yield for the period of 1914 to 1917, inclusive, of 17.9 tons for the plat receiving barnyard manure at the rate of 30 2-horse wagonloads per acre.

In fertilizer tests with sweet potatoes, 3-year average yields were secured ranging from 86 bu. per acre for the plat receiving dried blood and acid phosphate to 260.9 bu. for that receiving sulphate of ammonia, muriate of potash, and acid phosphate. The maximum corn yield, 23.31 bu. per acre, was secured from the plat receiving dried blood, sulphate of potash, and acid phosphate.

A series of experiments begun near Hastings in 1917 is described, in which observations were made upon the potash requirements of potatoes and of the relative value of different sources of phosphorus for potatoes. The effect of the different fertilizer treatments upon a cover crop of cowpeas following the potatoes is also noted. In the potash experiments complete fertilizers containing 1, 3, and 5 per cent of potash were compared with each other and with fertilizers containing no potash. The phosphate carriers compared included acid phosphate, finely ground pebble phosphate rock, and soft phosphate rock. Tabulated data are presented showing the yield of potatoes obtained under the different treatments arranged according to grades. Based on the total yields secured the potash plats greatly outyielded the plats without potash, the yields increasing with an increase in the amount of potash applied. No difference in the appearance of the cover crop was noted on either the potash plats or those without potash. Acid phosphate gave better results both in stand and yield than raw rock phosphate, while on the plats receiving no phosphorus the potato plants are said to have averaged fully 50 per cent smaller in size than those on the acid phosphate plats, while marked differences in color and maturity were also noted. The cover crop gave much the same results as the potatoes, the vines being only from 50 to 60 per cent as high on the no-phosphate plats as on those receiving phosphate applications.

Variety tests with cotton are described, in which yields were secured ranging from 336 lbs. of seed cotton per acre for Sosnowski to 726 lbs. for Cook Improved, 35 and 48 per cent of the total yields, respectively, being secured at the first picking.

Heavy parent hills of sweet potatoes planted April 5 and 27 produced 0.15 lb. per plant, or approximately 15 bu. per acre, more than light hills. Plantings made on June 25 from cuttings failed to show any correlation between the yield of parent hill and offspring plantings.

Brief notes are presented on certain promising new grasses, including *Pennisetum purpureum*, *P. merkeri*, *P. longistylum*, *Eriochloa subglabra*, *Osterdamia matrella*, *Digitaria didactyla*, *Paspalum notatum*, *Chrysopogon montanus*, *Brachiaria plantaginea*, and *Andropogon faveolatus*. See also a previous note (E. S. R., 41, p. 37).

**[Summary report of State and cooperative experiment farms in Wyoming, 1917 and 1918]** (*Bien. Rpt. Bd. Farm Comrs. [Wyo.], 1917–18, pp. 3–102, pls. 15*).—Continuing work previously noted (E. S. R., 39, p. 229), numerous field tests conducted at several centers in the State with grain and forage crops are described.

**[Report of work with field crops on the Canada Experimental Farms, 1917]**, J. H. GRISDALE ET AL. (*Canada Expt. Farms Rpt. 1918, pp. 9, 10, 12, 13, 14, 15, 20–22, 25–27, 34, 35–37, 43–45, 48–50, 51–60, 63, 68–70, 74, 75, 80–82, 86, 87, 94–97, 100, 101, 105, 106, 107, 109, 112–114, 116, 117, 119, 122, 123, 126, 127, 130, 131, 133, 136, 137, 142–144, 146, 147*).—This briefly describes the progress of work conducted along the same general lines as previously noted (E. S. R., 40, p. 735), embracing variety, fertilizer, rotation, and cultural tests with wheat, oats, barley, rye, field peas, flax, hemp, alfalfa, grasses, corn for forage, sugar beets, potatoes, turnips, mangels, carrots, vetches, clovers, rape, and tobacco. Plant breeding work with cereals is also noted.

**[Report of field crops work in St. Vincent, 1917–18]**, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1917–18, pp. 3–10, 15–23*).—This notes the progress of work along the same general lines as previously indicated (E. S. R., 39, p. 835), including manurial experiments with Sea Island cotton, reported on in more detail elsewhere (E. S. R., 40, p. 627), and arrowroot, and breeding work with cowpeas, *Dolichos lablab*, castor bean, and tomatoes. Statistical information is also given relative to the production in the island of cotton, corn, arrowroot and cassava for starch, sugar cane, peanuts, and peas.

Arrowroot mulched with prunings of *Gliricidia maculata* produced on the average 53,950 lbs. of rhizomes per acre as compared with 17,371 lbs. from the untreated plats. In a comparison of different artificial and organic manures, an average yield of 49,385 lbs. per acre followed mulching with Gliricidia prunings, with an application of phosphate and potash next in order with 30,088 lbs., as compared with 20,439 lbs. from the untreated check.

**[Report of field crops work in British Guiana, 1917]**, J. B. HARRISON (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1917, pp. 6–22*).—Variety tests, hybridization and selection studies, and fertilizer experiments with sugar cane and variety tests with rice are described for the year ended December 31, 1917, in a continuation of similar work previously noted (E. S. R., 40, p. 242).

**[Report of field crops work in the Union of South Africa, 1918]**, F. B. SMITH, W. H. SCHERFFIUS, H. S. DU TOIT, and W. PYOTT (*Union So. Africa Dept. Agr. Rpt. 1917–18, pp. 15, 23, 24, 25, 30–33, 69–71, 145–147, 155–158*).—The work of the tobacco and cotton, grain, and dry-farming divisions for the year ended March 31, 1918, is outlined as heretofore (E. S. R., 40, p. 524), together with information relative to the acreage and production of corn, wheat, oats, barley, Kafir corn, potatoes, sugar cane, and miscellaneous forage crops. The report of the chief grain inspector is included.

**[Report of field crops work in Burma, 1918]**, A. E. ENGLISH (*Rpt. Dept. Agr. Burma, 1918, pp. 4–8*).—In continuation of work previously noted (E. S.

R., 40, p. 523) variety, cultural, and fertilizer tests with rice, sesame, wheat, peanuts, beans, cotton, sugar cane, tobacco, fiber crops, and miscellaneous forage crops are briefly described for the year ended June 30, 1918.

[Field crops in Burma], H. ADAMSON (*Bul. Imp. Inst. [So. Kensington], 16 (1918), No. 1, pp. 50–54*).—In an article entitled The Material Resources of Burma the author presents information relative to the area occupied by the principal field crops, together with their respective yields. The crops discussed include rice, sesame, millet, beans, peanuts, cotton, corn, wheat, gram, sugar cane, and tobacco.

[Field crops in Ceylon], W. MOLEGODE, B. F. SCHERFFIUS, C. DRIEBERG, and D. S. CORLETT (*Ceylon Agr. Soc. Year Book, 1919–20, pp. 62–68, 72–75*).—Brief notes are given on the production of rice, tobacco, dhall (*Cajanus indicus*), cotton, kapok, and castor in the island.

[The progress of crop investigations in India, 1917–18] (*Rpt. Prog. Agr. India, 1917–18, pp. 11–55, 60–63, 73, 74, pls. 2*).—This comprises a summary of work done in various parts of India to improve the different field crops and to increase production. The crops dealt with include wheat, rice, cotton, sugar cane, jute, indigo, tobacco, oil seeds, and miscellaneous forage crops.

[Report of field crops work in South Australia, 1918–19], W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust., 22 (1919), No. 7, pp. 527–534*).—The progress of cultural, variety, and fertilizer tests with wheat at Hammond, Butler, and Wilkawatt is described as heretofore (E. S. R., 40, p. 332).

Constructive rotations: Considerations in fertility, crops, drainage, and farm labor, J. F. BARKER (*Mo. Bul. Ohio Sta., 4 (1919), No. 7, pp. 209–214, fig. 1*).—In a contribution from the department of agricultural chemistry and soils, Ohio State University, the author discusses in a general manner practical systems of crop rotation for soil improvement in the State.

The temporary ley, R. G. STAPLEDON (*Jour. Bd. Agr. [London], 25 (1919), No. 11, pp. 1280–1311*).—Recommendations, based on rather extensive observations in England and Wales, are made relative to what are deemed to be adequate mixtures of legume and grass seeds for temporary pastures. Information is also presented showing the year of maximum yield and the probable duration of the various species included in the different seed mixtures, as well as the date of appearance and maximum development of the indigenous species when commercial seed is not sown.

The grasses and grasslands of South Africa, J. W. BEWS (*Pietermaritzburg: P. Davis & Sons, Ltd., 1918, pp. VI+161, pl. 1, figs. 24; rev. in Jour. Ecology, 7 (1919), No. 1–2, pp. 84–87*).—This work is said to comprise a preliminary contribution to a study of plant ecology in South Africa and also to supplement a previous paper on plant succession (E. S. R., 37, p. 526). A simplified key to the genera and species of South African grasses has been prepared and ecological notes on the principal species of each genus included. The development of the grasslands of different sections of South Africa is discussed in some detail, and various economic aspects of the subject are mentioned.

A list of English, Dutch, Zulu, and Sesuto names of grasses is appended.

[Grasses for paper making in the Union of South Africa], C. F. JURITZ ([*Union So. Africa, Min. Mines and Indus.*], *Indus. Bul. Ser., No. 7 (1919), pp. IV+115*).—This comprises rather detailed reports on the grasses of the eastern coast belt available for the manufacture of paper, and on the possibilities and prospects of paper making in the Union of South Africa, together with a comprehensive discussion of the history and of technical and industrial aspects of the subject and of raw materials suitable for paper making in South Africa.

Methods of selection applied to the cereals, J. BEAUVERIE (*Rev. Gén. Sci., 30 (1919), Nos. 3, pp. 79–87; 4, pp. 108–114*).—This comprises a general discus-

sion of the present status of the subject, with particular reference to crop improvement through pure line selection.

**Twinning in alfalfa**, W. SOUTHWORTH (*Jour. Heredity, 10 (1919), No. 4, pp. 182, 183, figs. 2*).—In connection with alfalfa hybridization work in progress at the Manitoba Agricultural College and previously mentioned (E. S. R., 31, p. 831), three cases of twinning appeared in hybrid seedlings during the season of 1918. The parentage of each pair is briefly traced, all three having descended from the same original cross made in 1911 between alfalfa ♀ and black medick ♂. Five of the six seedlings are said to have developed into strong vigorous plants.

**Variety tests with two-row barley, 1913–1916**, K. IVERSEN (*Tidsskr. Planteavl, 26 (1919), No. 1, pp. 1–37*).—Tystofte Prentice (Archer), said to have been the highest yielding strain in previous experiments, was grown in comparison with three early, short, and rather stiff-strawed strains and with three new later maturing sorts of barley at seven experimental centers representing different soil conditions for the period indicated. It is stated that the differences in yield between the early and late strains, which were relatively small, depended chiefly on whether the crop remained upright or lodged.

**[Observations on beer barleys in Argentina]**, C. D.-GIROLA (*Pub. Mus. Agr. [Soc. Rural Argentina], No. 10 (1918), pp. 20, figs. 4*).—The production of barley in Argentina for malting purposes is discussed and varieties deemed best suited for this purpose indicated.

**[The castor oil plant in Brazil]**, G. R. P. D'UTRA (*Bol. Agr. [Sao Paulo], 20. ser., No. 1–3 (1919), pp. 1–33, figs. 3*).—This is a general discussion of the production and utilization of the plant in Brazil.

**Red clover**, W. M. FINDLAY (*North of Scot. Col. Agr. Bul. 24 (1919), pp. 39*).—A general discussion of red clover production in Scotland, with recommendations for growing the crop under various soil conditions.

**Variety tests of corn [in North Carolina]**, G. M. GARREN (*Bul. N. C. Dept. Agr., 40 (1919), No. 5, pp. 36, figs. 2*).—This describes further tests (E. S. R., 38, p. 532) with different varieties of corn during 1917 and 1918, the work having been discontinued with the 1918 experiments. Biggs Seven-Ear, First Generation Cross No. 182, and Southern Beauty are deemed to be the best varieties for the Piedmont and Mountain sections of the State, and Biggs Seven-Ear and Latham Double for the Coastal Plain region.

**Some curious freaks of corn**, D. F. JONES (*Rural New Yorker, 78 (1919), No. 4541, p. 1043, figs. 2*).—Certain abnormal ears of corn are illustrated and their possible significance in tracing the origin of the corn plant briefly indicated.

**Description of a supposed new fossil species of maize from Peru**, F. H. KNOWLTON (*Jour. Wash. Acad. Sci., 9 (1919), No. 5, pp. 134–136, fig. 1*).—A fossilized ear of corn secured from a dealer in curios in Cuzco, Peru, by W. F. Parks, is described as a new species, *Zea antiqua*. Although lacking definite knowledge of the conditions under which the specimen was found, the author states that based on its thorough fossilization "it seems hardly likely to be younger than at least several thousand years," and that it "falls very little short of supplying the needed paleontological data on the antiquity of maize."

**A fossil ear of maize**, G. N. COLLINS (*Jour. Heredity, 10 (1919), No. 4, pp. 170–172, figs. 9*).—The author briefly reviews the paper noted above, compares the fossil form with varieties of corn still being grown in Peru and Bolivia, and concludes that "while the fossil ear is not duplicated by any ear in our collection it presents no new characters, but rather a different combination of characters found among the existing types."

**The inheritance of immunity to leaf blister mite (Eriophyes gossypii) in cotton**, S. C. HARLAND (*West Indian Bul., 17 (1919), No. 3, pp. 162–166*).—Ob-

servations on the $F_1$, $F_2$, and $F_3$ progeny of a cross between St. Vincent native cotton, said to be immune to *E. gossypii*, and Southern Cross Upland, a susceptible type, are held to indicate that immunity to attack from the blister mite behaves as a simple Mendelian recessive. The $F_1$ was intermediate though inclining toward the susceptible parent, while the $F_2$ segregated into 100 immune and 365 nonimmune individuals. In the $F_3$ 10 of the immune families bred true for immunity, while 37 nonimmune families again segregated into immune and nonimmune.

**The improvement of the yield of Sea Island cotton in the West Indies by the isolation of pure strains**, S. C. Harland (*West Indian Bul., 17 (1919), No. 3, pp. 145–161*).—It is stated that through individual plant selection and self-fertilization a marked improvement may be effected in certain morphological characters of Sea Island cotton which have to do with yield. Experimental work conducted in St. Vincent, following the method of pure line selection proposed and dealing with the number of ovules or seeds per loculus, number of loculi per boll, and the lint index (weight of lint per 100 seeds) in several strains of Sea Island cotton, is reviewed. The isolation of a strain capable of producing 31 per cent more lint per boll than the ordinary type grown in the island is said to have resulted.

**An improved type of cotton for the southern Maratha country [Bombay Presidency, India]**, G. L. Kottur (*Agr. Jour. India, 14 (1919), No. 1, pp. 165–167, pl. 1*).—This briefly describes a long staple cotton developed through continued selection from an erect type of a local variety. The new sort is said to produce 12 per cent more seed cotton, ginning 12 per cent higher than the local strain, and to grade 5 per cent higher than the best local cotton.

**Some of the problems arising out of the successful introduction of American cotton in the western Punjab**, W. Roberts (*Agr. Jour. India, 14 (1919), No. 1, pp. 42–48*).—It is stated that in 1917 a total of 274,000 acres was planted to American cotton, more than one-half of which was pure 4 F, a selection developed by the economic botanist. In connection with the rapid spread of American cotton culture certain problems, herein briefly discussed, have arisen relating primarily to the maintenance of a fair market price, the elimination of mixing with so-called "desi" cotton, and the production of pure seed of the preferred 4 F type.

**Egyptian cottons: Their deterioration and means of remedying it**, V. M. Mosséri (*Bul. Union Agr. Égypte, 16 (1918), No. 124, pp. 53–79; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 12, pp. 1441–1443*).—The author states that while Egyptian cottons have declined both in production and quality it is more in the nature of a deterioration than a degeneration to be attributed largely to an indiscriminate mixing of varieties. The isolation and purification of superior strains, the dissemination of seed of only approved sorts, and the prevention of subsequent contamination are believed to be essential to the improvement of the crop. The desirability of Government aid in achieving this end is discussed.

**Cotton**, G. Bigwood (*London: Constable & Co., Ltd., 1918, pp. VIII+204, pls. 16*).—This comprises a popular account of the development of the cotton industry, together with a discussion of some of the problems confronting cotton manufacturers at the present time. A paper on Cotton Futures by C. Stewart is appended.

**The early history of cotton in Bombay**, J. Mackenna (*Agr. Jour. India, 13 (1918), No. 3, pp. 389–404, pl. 1*).—A lecture delivered before the Students' Cotton Association, Sydenham College of Commerce, Bombay, in January, 1918.

**The work of the Imperial Institute in connection with British cotton cultivation** (*Bul. Imp. Inst. [So. Kensington], 16 (1918), No. 1, pp. 79–89*).—The

activities of the Institute in promoting cotton production in the British Empire are briefly outlined. A list, comprising some 97 reports, special articles, etc., dealing with various phases of the crop which appeared in the *Bulletin* of the Institute from 1905 to 1917, inclusive, is also presented.

Cottonseed by-products (*Nature [London], 103 (1919), No. 2582, pp. 153, 154*).—A paper presented before the Royal Society of Arts by E. C. de Segundo on The Removal of the Residual Fibers from Cotton Seed and their Value for Nontextile Purposes is briefly reviewed. The development of ginning machinery for the more complete removal of lint from cotton seed and a process for removing the last trace of fiber from the hulls after decortication comprise the principal features dealt with.

**Fiber plant investigations [in South Africa]**, E. Holmes-Smith (*So. African Jour. Indus., 2 (1919), No. 2, pp. 157–172*).—This describes a survey of the Transkei and southeastern coastal districts of the Cape Province for the purpose of ascertaining their suitability to fiber production and to the establishment of the fiber industry. It is concluded that the region is well adapted to the production of hard fibers, *Agave rigida*, *Furcræa gigantea*, and *Phormium tenax* being recommended in particular. Directions for growing the crops and for preparing the fiber for market are included.

**Production of flax fiber and seed flax in Canada**, F. C. Robertson (*U. S. Dept. Com., Com. Rpts., No. 124 (1919), pp. 1031–1034*).—A report on the present status and future prospects of the flax industry in Canada.

**Tests with flax varieties**, G. S. Gordon (*Jour. Dept. Agr. Victoria, 17 (1919), No. 3, pp. 164–170, figs. 4*).—Limited variety tests, conducted at Werribee (Victoria) during 1918 with seed of both American and English origin, are briefly noted.

**The flax industry [in Victoria]**, J. Robilliard (*Jour. Dept. Agr. Victoria, 17 (1919), No. 4, pp. 222–230, figs. 8*).—Field practices and cultural methods employed in growing the crop and the preparation of the fiber for market are described.

**Lalang grass as a paper material**, B. J. Eaton (*Agr. Bul. Fed. Malay States, 7 (1919), No. 1, pp. 28–32*).—This comprises a brief discussion of a report on lalang grass (*Imperata arundinacea*) as a paper material, presented by the Imperial Institute and previously mentioned (E. S. R., 40, p. 823). It is stated that this grass compares favorably with Algerian esparto grass, but is inferior to Spanish esparto.

**Official grain standards of the United States for oats**, D. F. Houston (*U. S. Dept. Agr., Bur. Markets Serv. and Regulatory Announcements, No. 46 (1919), pp. 6*).—This contains the order of the Secretary of Agriculture establishing the official standards for oats, effective June 16, 1919.

**Handbook official grain standards for oats** (*U. S. Dept. Agr., Bur. Markets, 1919, pp. 6*).—This comprises a tabulated and abridged description of the official standards for oats compiled from the publication noted above.

**The spraying of Irish potatoes**, R. W. Leiby (*Bul. N. C. Dept. Agr., 40 (1919), No. 3, pp. 38, figs. 12*).—This describes experimental work covering the period of 1913–1918, inclusive, conducted at the Buncombe County substation in an effort to ascertain the best practical means of controlling the important insect and disease pests affecting the fall or late Irish potato crop in North Carolina. The plan of the experiment comprised observations on the comparative value of spraying with Bordeaux mixture to control blight, hand-picking to control the Colorado potato beetle, and spraying with Bordeaux mixture and arsenate of lead combined to control both the beetles and blight. The results secured during each year of the experiment are discussed in detail and may be summarized as follows:

Maximum yields were secured by spraying at least four times during the growing season with a 3:4:50 Bordeaux mixture to which had been added 1.5 lbs. of powdered arsenate of lead. An average gain of 51.6 bu. per acre, representing 64.2 per cent, was obtained from the use of this spray over unsprayed potatoes. The labor and materials required to do the spraying were estimated to amount to $7.67 per acre and the net gain to $47.17. Bordeaux mixture alone produced an increase in yield of 35 bu. per acre over the check, at an average cost of four applications of $5.32 and a net profit of $33.22. Hand-picking Colorado potato beetles resulted in an increase in yield of 8.6 bu. per acre, obtained at a cost of $5.64 and with a net profit of only $4.82. On the basis of close observations made during the past five years and a general knowledge of insects and diseases attacking the late Irish potato crop in the State, it is concluded that the potato grower may expect more or less destructive outbreaks each year of the Colorado potato beetle, flea beetle, early blight, and tipburn.

Directions for making and applying poisoned Bordeaux mixture are appended.

**Report on the composition of potatoes grown in the United Kingdom** (*London: Food (War) Committee, Roy. Soc., 1919, pp. 31, figs. 5*).—Information is presented relative to the total dry matter and nitrogen content of 227 samples of six main crop and four second early varieties of potatoes and 20 samples of 17 miscellaneous sorts secured from 65 growers in England, Wales, Scotland, and Ireland. The general average for all samples was 22.09 per cent of dry matter and 0.327 per cent of nitrogen.

**Rice [in Argentina]**, G. S. Ito (*Bol. Min. Agr. [Argentina], 23 (1918), No. 1, pp. 3–123, figs. 47*).—The development and future of the industry in Argentina are discussed in considerable detail.

**Preliminary notes on rice selection work at Saigon**, E. Carle (*Bul. Agr. Inst. Sci. Saigon [Cochin China], 1 (1919), No. 3, pp. 74–87*).—The progress of efforts to improve the rice crop through selection is described. Agronomic data relative to a number of varieties of rice are included.

**The transplanting of rice in Egypt**, V. M. Mosséri (*Bul. Union Agr. Égypte, 16 (1918), No. 123, pp. 21–50*).—This describes the continuation during 1916 and 1917 of work previously noted (E. S. R., 37, p. 538). The results of the earlier tests were confirmed, the conclusion being reached that seeding rice directly in the field was more advantageous than transplanting from a seed bed.

**Utilization of rice and its by-products** (*Bul. Imp. Inst. [So. Kensington], 16 (1918), No. 1, pp. 16–24*).—Supplementing a previous account (E. S. R., 39, p. 838), this article comprises a discussion of the suitability of various kinds of Burmese rice for industrial and other purposes. The profitable utilization of rice straw and rice husks in the manufacture of paper is deemed doubtful except in the preparation of low grades or strawboard.

**A forage plant from the Solanaceae family**, B. H. Hunnicutt (*Jour. Heredity, 10 (1919), No. 4, pp. 184–187, figs. 2*).—This comprises a rather popular account of *Solanum bullatum*, said to be a valuable forage crop found growing wild in many parts of Brazil.

**Fertilizer experiments with sugar cane [at Tucumán]**, W. E. Cross (*Rev. Indus. y Agr. Tucuman, 9 (1918), No. 5–6, pp. 72–85; abs. in Chem. Abs., 13 (1919), No. 8, p. 885*).—This describes the continuation of work along lines similar to those previously noted (E. S. R., 33, p. 336) for 1915 and 1916, and the inauguration of a new series of experiments with Java cane during 1917 and 1918 in which potassium sulphate, Thomas slag, and ammonium sulphate were used alone on both limed and unlimed soil.

Neither potassium nor phosphorus effected any material increase in the yield of either cane or sugar, while phosphorus delayed the maturity of the cane on unlimed land. Ammonium sulphate resulted in an increase in all cases, but usually without profit.

**Experiments on stripping [sugar] cane**, W. E. Cross (*Rev. Indus. y Agr. Tucuman, 9 (1919), No. 7–8, pp. 110–114, fig. 1; trans. in La. Planter, 62 (1919), No. 19, pp. 301, 302, fig. 1*).—Observations made at Tucuman during 1917 and 1918 on the effect upon the composition of the juice of stripping the dried and dead leaves from the lower part of the stalks of sugar cane are held to indicate that the practice did not hasten the maturity of the cane.

**Costs of production in the sugar industry** (*U. S. Tariff Com., Tariff Inform. Ser. No. 9 (1919), pp. 55, pls. 3, fig. 1*).—"Comprehensive tables were prepared . . . in which the total costs and the segregated items of cost for every factory from which returns were obtained are displayed in detail. They cover the cane-sugar industry in Cuba, in Hawaii, in Louisiana, and in Porto Rico, and the beet-sugar industry in the continental United States. For each of these regions there are three tables, the first showing costs in the prewar period, the second for the crop of 1916–17, and the third for the crop of 1917–18." For the second period 178 factories are reported and in the third 152. These basic tables show the output in tons, total cost, seggregated items of total and factory cost, and averages by factories and by tonnage.

From the fact that the cost of the raw material is the most important item, it is shown that sugar is essentially an agricultural product. The suggestions from the available data are in favor of large-scale production of cane or beets.

In the appendixes there are copies of the schedules used in collecting data, and illustrative charts.

**Notes on the germination of tobacco seed.—III, Notes on the relation of light and darkness to germination**, T. H. Goodspeed (*Univ. Cal. Pubs. Bot., 5 (1919), No. 16, pp. 451–455*).—As a further contribution to work previously noted (E. S. R., 33, p. 636), the author describes observations on the effect of light and darkness upon the germination of five varieties each of *Nicotiana tabacum* and *N. rustica*, preliminary to a more thorough and better controlled series of investigations.

Part of the seed was placed in a glass-sided germinating case maintained at a constant temperature of about 30° C (86° F.) and in which a 40-watt tungsten electric-light bulb was hung so that the seed was exposed to the light continuously. Duplicate samples of seed were also subjected to continuous darkness in the germinator by placing them in covered paper boxes. In another series of tests the seeds were kept in darkness in closed boxes and were also left undarkened near a window, but not in direct sunlight and without any attempt to regulate the temperature. Only two-year-old seed of the *N. rustica* varieties was employed, while that of the *N. tabacum* varieties ranged from 2 to 12 years in age. The germinated seeds were counted at frequent intervals over a period of more than 20 days and the data recorded in tabular form.

Contrary to the results secured by Honing (E. S. R., 38, p. 127), working with commercial strains of *N. tabacum* derived largely from the basic types employed in these observations, the seeds of all varieties of both *N. tabacum* and *N. rustica* were found to germinate readily in darkness. It was also noted that old and new seed germinated equally well in darkness.

**Nomenclature of wheats grown in South Africa** (*Union So. Africa, Dept. Agr. Bul. 1 (1919), pp. 15*).—The correct name and the names commonly applied to the different kinds of wheat grown in South Africa are presented in tabular form, together with notes on the more prominent agricultural and botanical

characteristics of each. The varieties dealt with include 24 strains of durum wheat, 17 common bearded sorts, and 41 beardless types.

**Kota, a rust resisting variety of common spring wheat**, L. R. Waldron and J. A. Clark (*Jour. Amer. Soc. Agron., 11 (1919), No. 5, pp. 187–195, pl. 1*).—This paper, a joint contribution from the North Dakota Experiment Station and the Bureau of Plant Industry, U. S. Department of Agriculture, describes observations on the yielding ability, rust resistance, and milling and baking qualities of a bearded hard red spring wheat variety designated as Kota (C. I., No. 5878), as compared with durum wheat and with other common spring wheat varieties. Kota is said to have been separated in 1917 from Monad, a durum sort introduced into this country from Russia in 1903 by H. L. Bolley.

Field observations of pure line selections of Kota are held to indicate that the variety possessed a resistance to the form or forms of stem rust of wheat (*Puccinia graminis tritici*) present at Fargo, N. Dak., Brookings, S. Dak., and St. Paul, Minn., in 1918, which was decidedly greater than that exhibited by the common spring wheats, and second only to that of the more resistant durum wheats. Data from greenhouse inoculation experiments conducted by E. C. Stakman at the Minnesota Experiment Station and by L. E. Melchers at the Kansas Experiment Station with different biologic forms of the rust are also briefly reviewed. Yield data for the season of 1918 showed an average of 31.92 bu. per acre for six durum varieties, 22.82 bu. for ten common spring wheats, and 29.53 bu. for Kota. Marquis produced 29.33 bu.

Kota was found to yield somewhat less flour than the average for the wheats examined, while in the baking tests it exceeded the other common spring wheats except Marquis, which it equaled.

**Results of wheat variety and manurial trials, season 1918–19, I, II** (*Jour. Dept. Agr. Victoria, 17 (1919), Nos. 3, pp. 158–163; 4, pp. 217–221*).—This describes the continuation of work previously noted (E. S. R., 39, p. 540; 40, p. 337).

The highest yielding varieties of wheat tested at Longerenong were hybrid Gallipoli, selected Federation, and a hybrid strain, Federation×Bobs, with yields amounting to 41.9, 40.3, and 40 bu. per acre, respectively. In a comparison of a number of hybrid strains with selected varieties, hybrid Gallipoli was again first with 45.8 bu. per acre.

Rate-of-seeding tests with Federation showed a gradual increase in yield with an increase in the rate of seeding up to 75 lbs. per acre for early seeding (May 31) and up to 120 lbs. for late seeding (July 10). In a comparison of early and late seeding for early, midseason, and late maturing varieties the early varieties yielded better when sown late, but not so well as the midseason varieties sown at the same time.

Tests with 8 barley varieties resulted in yields ranging from 55.9 bu. per acre for Kinver to 76.2 bu. for Oregon.

Additional variety tests with wheat were conducted at Ouyen, Cowangie, and Carwarp in the Mallee area. The leading varieties were Dart Imperial and Yandilla King, each with 21.2 bu. per acre for a 3-year average at Ouyen, Federation with 28.3 bu. for a 4-year average at Cowangie, and Currawa with 18.4 bu. for a 3-year average at Carwarp.

Fertilizer tests with wheat, conducted at various experimental centers, are held to indicate that moderately heavy applications of superphosphate give the best results.

**Irrigation and the protein content of wheat**, J. S. Jones, C. W. Colver, and H. P. Fishburn (*Idaho Sta. Bul. 109 (1918), pp. 3–43, figs. 11*).—Investigations conducted near Gooding, Idaho, during the period of 1910–1916, inclusive, are described which were undertaken in an effort to ascertain the effect

of irrigation upon the protein content of wheat, the fundamental reasons for the influence of soil water upon protein formation, and the cumulative effect of different amounts of irrigation water on the protein content. The plan of the experiment involved the growing of three varieties of wheat side by side on one-fifth and one-tenth acre plats in such a manner that varying amounts of irrigation water could be applied. Quantitative determinations of the soil nitrates were made at frequent intervals on certain of the plats to determine the relative amounts present and their possible concentration under the influence of irrigation water in zones beyond the feeding range of the plant roots. Milling tests and analytical work on representative samples of grain from each plat are also reported. Field observations and analytical data are presented in tabular form for each year of the experiment and briefly discussed.

Substantial variations in the amount of irrigation water failed to produce any marked effect on the protein content of the grain. The data also failed to reveal any concentration of soil nitrates in zones beyond the feeding range of the wheat plant. No cumulative or permanent effects of large amounts of water upon the protein content of wheat were observed.

The results secured are held to indicate that while wheat grown under irrigation in the Snake River region is in general soft, starchy, and of low protein content, this condition is not due to irrigation but to a lack of available nitrogen in the raw sagebrush soils brought under cultivation on irrigation projects. The rotation of wheat with alfalfa or red clover is said to result in a decided improvement in the quality of the grain, while protein elaboration was also somewhat stimulated. It is stated that nevertheless carelessness in the use of irrigation water may offset otherwise favorable soil conditions for maximum protein elaboration. It is concluded that however "deteriorated" in quality a really good variety of milling wheat may have become through growth under irrigation on soils depleted of available nitrogen, seed from it will respond with the production of maximum amounts of protein for the variety if given the favorable conditions of growth indicated, and that nothing is to be gained by importing seed of that variety from distant localities. A more rigid selection of varieties on the basis of well-recognized milling qualities is also emphasized.

**Official field crop inspection**, H. L. Bolley (*Jour. Amer. Soc. Agron., 11 (1919), No. 5, pp. 196–205; also in Science, n. ser., 50 (1919), No. 1287, pp. 193–199*).—In this paper, a contribution from the North Dakota Experiment Station, the author discusses the necessity and desirability of a legal basis for bringing about stability and standardization of varieties in cereal cropping. It is suggested that this be accomplished by a law authorizing crop inspection in the field, seed certification, seed standardization, and seed listing, all under the supervision of an expert preferably associated with the State experiment station.

**The size of seed**, W. M. Findlay (*North of Scot. Col. Agr. Bul. 23 (1919), pp. 16*).—Field tests, conducted at various experimental centers in Scotland, are described in which observations were made on the effect upon yield of different sized seeds in the same sample of oats, barley, turnips, and red clover; of different sized seeds in different samples of oats, turnips, and red clover; and of sifting out small oat seeds.

The results are held to indicate that in a single sample of seed large seeds produced more than small seeds. In different samples of the same kind of seed the strain and origin of the seed were of more importance than the size of the seed. When ungraded seed was employed, the plants produced by the large seeds exerted a considerable adverse influence upon those from small

seeds. It is concluded that small seeds should be discarded and only uniformly large seeds used.

**Seed Reporter** (*U. S. Dept. Agr., Seed Rptr., 3 (1919), No. 2, pp. 8*).—The principal features of this number comprise a report on the vegetable seed acreage for 1918 and 1919 and the average crop condition on June 30, 1919, by States and crops, together with an incomplete report on field seed stocks and receipts for the United States as of June 30. Information is also presented relative to the redtop seed crop for 1919, onion sets in the Chicago, Louisville, and other districts, the timothy seed outlook, bur clover seed production in California and the Southern States, vegetable seed crop conditions, the seed garden pea outlook, the crimson clover seed situation, the prospects for seed oats and rye in the South, the early crop alfalfa seed outlook in Texas, New Mexico, Oklahoma, and Arizona, the meadow fescue seed crop for 1919, and Bermuda onion seed production in California. A summarized statement is given showing the results of an inquiry as to the utilization, interest, and relative value of the information published in the *Seed Reporter*. The usual statistics pertaining to the imports of forage plant seeds permitted entry into the United States are included.

**Field weeds in their relation to forage: Determination of their fruit and seed**, A. Naumann (*Arch. Wiss. u. Prakt. Tierheilk., 44 (1918), Sup., pp. 310–356, pl. 1, figs. 20*).—The utilization of weeds for forage and of their fruits and seeds in feeding materials is discussed, together with information concerning the relation of weeds to plant diseases. A key for the identification of the fruits and seeds of a number of weeds is included.

**Tests of chemical means for the control of weeds**, G. P. Gray (*Univ. Cal. Pubs. Agr. Sci., 4 (1919), No. 2, pp. 67–97, figs. 11*).—The progress of experimental work begun in 1915 on the use of chemicals for the control of weeds in California, particularly the wild morning-glory, is described. The work embraced two lines of investigation, viz, the eradication of weeds by the root-absorption method, whereby the soil in the vicinity of the roots of the weeds is more or less permeated with the herbicide, and weed control by the leaf-absorption method whereby the foliage is sprayed with the herbicide. In testing the first method arsenic trioxid, sodium cyanid, sulphuric acid, acid sludge, acid tar, common salt, carbon bisulphid, copper sulphate, and iron sulphate were employed, while in the second method an arsenical spray was used.

Results secured with the leaf-absorption method in preliminary experiments in the coast region of the State have already been noted (E. S. R., 38, p. 140), and are also discussed in the present paper. It is stated further that the root-absorption method failed to control wild morning-glory on agricultural land at a reasonable expense and without serious injury to the soil. Incidental to the main object of the study, data have been secured which are held to demonstrate the superiority of arsenic as a soil sterilizer.

**The use of chemical sprays for combating weeds**, J. Adams (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.], 10 (1917–18), pp. 70–78*).—Field plat tests conducted at Ottawa during 1916 are briefly reviewed in which observations were made on the effect of spraying wild mustard, purslane, dandelion, and Canada thistle with a 20 per cent iron sulphate solution and with sodium arsenite (1 part to 250 parts of water). Chemical substances regarded as having given promising results in controlling weeds include sulphuric acid, iron sulphate, copper sulphate, common salt, caustic soda, sodium arsenite, carbolic acid, orchard heating oil, and fuel oil. A list of weeds which are said to be amenable to control by chemical methods is also presented, and the material giving the best results in each case indicated.

**Eradication of weeds by sprays and manures**, W. E. BRENCHLEY (*Jour. Bd. Agr. [London], 25 (1919), No. 12, pp. 1474–1482*).—The author discusses in a general manner the utilization and relative value in the eradication of weeds of chemical sprays, such as copper sulphate, iron sulphate, sulphuric acid, etc., and of finely ground materials applied as dusts, including calcium cyanamid, kainit, common salt, and lime. It is concluded that although no definite recommendations are justified at the present time the use of finely ground materials offers marked possibilities in weed control in addition to such beneficial manurial effects as the material might exert on the crop.

## HORTICULTURE.

**Practical vegetable gardening**, J. BÖTTNER (*Praktische Gemüsegärtnerei. Frankfort on the Oder: Trowitzsch & Son, 1919, 9. rev. and enl. ed., pp. II+386, figs 355*).—A treatise on the principles of vegetable gardening, including specific directions for growing various crops.

**Grow your own vegetables**, S. C. JOHNSON (*London: T. Fisher Unwin, Ltd., [1918]. p. 199, figs, 119*).—A practical handbook on home vegetable gardening in England.

**The garden frame for food and flowers**, W. F. ROWLES (*London: C. Arthur Pearson, Ltd., 1919, pp. 112*).—A practical treatise on the use of the hotbed and cold frame, based upon the author's long experience as a gardener in various parts of England and Scotland.

**[Report on horticultural work for the year ended March 31, 1918]**, W. T. MACOUN ET AL. (*Canada Expt. Farms Rpt. 1918, pp. 10, 12, 13, 14, 15, 32, 33, 34, 35, 64, 70, 75, 76, 81, 82, 97, 98, 101, 102, 103, 105, 106, 107, 109, 110, 114, 117, 118, 120, 123, 127, 131, 134, 138, 144, 147*).—A brief progress report on horticultural work at the Central Farm, together with notes on tests of fruits, vegetables, and ornamentals at the branch farms and stations, and continuing previous work (E. S. R., 40, p. 741).

**The carob in California**, I. J. CONDIT (*California Sta. Bul. 309 (1919), pp. 431–440, figs. 6*).—An account of the carob (*Ceratonia siliqua*), with reference to its introduction into California, botany, climatic, and soil requirements, propagation, planting, yield, and varieties.

**Notes on the dasheen and chayote**, H. W. YOUNGKEN (*Amer. Jour. Pharm., 91 (1919), No. 8, pp. 498–510, figs. 15*).—Notes on the histology of the Trinidad dasheen and the chayote, including general notes on their cultural status in the United States.

**Hardy fruit culture**, C. F. LAWRANCE (*London: Evans Brothers, Ltd., [1919], pp. [IV]+80, figs. 31*).—A small treatise on home fruit gardening in England.

**The fruit growers' yearbook and market gardeners' guide, 1918** (*Fruit Growers' Yearbook [London], 26 (1918), pp. 164, pls. 4*).—This annual contains a number of articles relating to fruit and vegetable growing in Great Britain, and includes a monthly working calendar for outdoor and indoor work.

**Decade records in Ohio apple orchards, Nos. 2 and 3**, H. A. GOSSARD (*Mo. Bul. Ohio Sta., 4 (1919), Nos. 6, pp. 171–178, figs. 5; 7, pp. 203–208, figs. 5*).—These papers record the results secured from long-continued spraying tests in the second and third of three representative Ohio orchards (E. S. R., 41, p. 239). The method of conducting the tests, as well as cultural and marketing practices, are briefly described. Yields, financial returns, and the record of worminess for each year under different spray treatments are presented in tabular form. The results as a whole indicate that spraying for worminess has been highly profitable.

In the Stokes orchard (No. 2), spraying twice, once just after bloom and again soon after bloom, has given an annual average of 90 to 95 per cent of sound fruit as compared with about 98 per cent of sound fruit in the orchard previously reported on, which was sprayed once just after bloom fall and again in midsummer. The average yield per acre for the 10-year period was 448 bu., the average gross income per acre $406.45, and the average net income per acre $183.68, figuring the cost at 50 cts. per bushel.

In the Starcher orchard (No. 3), selected to test performance in a hilly section, three sprayings, two soon after bloom and a third in July, gave an average of only 1.66 per cent of worminess while two sprayings made soon after bloom gave an average of 2.92 per cent wormy fruit. Owing to two crop failures the average gross income per acre of this orchard, which was 15 years old at the beginning of the experiment, has not been high; only $71.93. The estimated annual net income per acre on a cost basis of 50 cts. per bushel was $23.90. It is pointed out that the cost of producing apples on such cheap hill land is probably much less than 50 cts. per bushel and that actual prices of good fruit are now much higher; hence the man with limited capital may expect good financial returns from orchards developed on these cheap hillside lands.

**Using an apple sizing machine**, I. P. Lewis (*Mo. Bul. Ohio Sta., 4 (1919), No. 7, pp. 221–224, figs. 3*).—A descriptive account with illustrations.

**Experiments with citrus trees**, B. F. Floyd (*Florida Sta. Rpt. 1918, pp. 39–53, figs. 2*).—A progress report on a number of fertilizer experiments with citrus trees is given.

One set of experiments, here described in detail, includes a comparative test of phosphoric acid from different sources. The phosphoric acid is used in combination with other elements, although no potash has been used thus far. The test is being conducted with young trees on virgin soil, with young trees on soil completely fertilized during the two years before planting, and with bearing trees over 25 years old that have always been well fertilized. Thus far the trees in all of the experimental groves have made satisfactory growth, and no differences have become evident that can be attributed to the fertilizer treatment.

An experiment was started in 1914 to determine the influence of fertilizer treatment upon the coloration of grapefruit in a grove where the fruit showed a greenish tint at maturity instead of a normal deep yellow. The results indicate that the fertilizer treatment was not a controlling factor in the development of the trouble, but that the controlling factor was associated in some way with the influence of the stock upon the scion.

Other experiments, here outlined, that have not been conducted long enough to warrant deductions include a study of the influence of different ratios of phosphoric acid and potash in fertilizers upon tree growth and fruit production, and the efficiency of finely ground phosphate rock, stable manure, and legumes as a fertilizer for citrus trees.

**Report of assistant plant physiologist**, M. Nothnagel (*Florida Sta. Rpt. 1918, pp. 54, 55*).—The main line of work for the year has been a study of the time of development and structure of fruit buds in citrus. Material for study was collected from summer, fall, and spring flushes at various stages, ranging from the time the flush started growth until the following flush was beginning growth.

A gross examination of the material showed no external clue to the kind of bud or buds that were to develop in a cluster in the following growth. The microscopic examination showed a cluster of two to four buds in the axil of

every leaf and bud differentiation at an early stage in the development of the flush. This differentiation was based upon differences in the crowns of the growing tips. "Those of the fruit buds were rounded, with opposite projections below, that would develop into floral parts, while below these opposite projections there were alternate projections that would mature into leaves. The crowns of the leaf buds were conical, with only alternate projections below, that would develop into leaves. The development of the different buds was followed to the point where the evident growth showed the crown differences to be distinguishing characters." The study is to be continued.

**Citrus experiment grove**, S. E. COLLISON (*Florida Sta. Rpt. 1918, pp. 79–83*).—In continuation of previous reports (E. S. R., 39, p. 448) measurements are given showing the increase in diameter of the trees of the various plats from 1909 to 1918, together with data showing a partial chemical analysis of leaves and stems collected from the different plats.

A study of the 24 poorer plats led to the conclusion that no particular source of nitrogen can be singled out as having been injurious to vigor or amount of growth, but that too much nitrogen is injurious to growth. An injurious effect on growth was also produced by the use of ground limestone, and poor growth resulted where kainit and Thomas slag were used on the trees. No definite conclusions are thus far drawn as to the best fertilizer treatment.

Analyses of leaves from the different plats showed that the figures for nitrogen, magnesia, iron, and phosphoric acid ran very close together. The average percentage of lime was higher in the leaves from plats receiving lime, but the higher lime content was not found in the stems. In plats receiving excessive amounts of nitrogen, the stems contained less nitrogen than the stems from the remainder of the plats. No striking differences were observed in the leaves and stems from the plat receiving no fertilizer, except that they contained more magnesia than leaves and stems from any of the other plats.

**Citrus growing in South Africa.**—Oranges, lemons, naartjes, etc., R. A. DAVIS (*Pretoria: Dept. Agr., 1919, pp. 66, pl. 1, figs. 45*).—A practical treatise on the culture, packing, and marketing of citrus fruits.

**Experiments in the culture, selection, and manuring of coconuts in Madras**, W. MCRAE and R. D. ANSTEAD (*Inst. Colon. Marseille, Bul. Mat. Grasses, No. 3 (1919), pp. 100–103*).—Notes on experiments conducted for several years at Alleppi by G. H. Davey.

**The coconut in Cochin China**, P. MORANGE (*Inst. Colon. Marseille, Bul. Mat. Grasses, No. 3 (1919), pp. 89–94*).—A brief report on the present status of and future prospects for the coconut and copra industries in Cochin China.

## FORESTRY.

**Forest management**, A. B. RECKNAGEL and J. BENTLEY, JR. (*New York: John Wiley & Sons, Inc., 1919, pp. XIII+269, pls. 4, figs. 26*).—A text-book and treatise on forest management, the successive chapters of which consider survey of area, forest mensuration, log rules, instruments for forest measurements, the measurement of felled trees, the measurement of standing trees, volume tables, timber estimating, age of trees and stands, growth of individual trees, increment of stands, forest organization, regulation of the cut, the working plan document, forest finance, and forest administration. An appendix contains numerous related tables, outlines for forest description and planting plan, and form for tree measurements.

**A National Forest policy**, H. S. GRAVES (*Amer. Forestry, 25 (1919), No. 308, pp. 1281, 1282*).—The author here presents some principles requiring the prac-

tice of forestry on private lands which, it is believed, should form the foundation of the system to be built up through the necessary legislation by the Federal and State Governments.

**Some proposals with regard to natural afforestation in a New Zealand mountain area**, W. G. Morrison (*New Zeal. Jour. Sci. and Technol., 2 (1919), No. 4–5, pp. 339–349, figs. 3*).—The author presents observations on the progress of natural afforestation on the Hanmer Plains area of New Zealand, and advocates regeneration of other mountain areas by the introduction of seed trees adapted to the environment.

**The Douglas fir, a tree giving large returns**, V. Manvilli (*Italia Agr., 56 (1919), No. 8, pp. 231–237*).—The author outlines the successful culture of Douglas fir (*Pseudotsuga douglasii*) in various European countries, and recommends it for mountain planting on a large scale in Italy.

**The collection and some uses of the oleoresin of Douglas fir (Oregon fir balsam, Douglas fir turpentine)**, S. A. Mahood (*Amer. Jour. Pharm., 91 (1919), No. 6, pp. 345–349, fig. 1*).—The methods of collecting the oleoresin and its commercial uses are briefly reviewed.

**The Hawaiian genus Kokia.—A relative of the cotton**, J. F. Rock (*Bd. Agr. and Forestry Hawaii, Div. Forestry Bot. Bul. 6 (1919), pp. 22, figs. 8*).—A descriptive account of the species of this genus.

**The true mahoganies**, R. A. Rolfe (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 4 (1919), pp. 201–207*).—Descriptive accounts are given of the species of Swietenia, to which what may be termed true mahoganies belong.

**Mahogany, and the recognition of some of the different kinds by their microscopic characteristics**, H. H. Dixon (*Sci. Proc. Roy. Dublin Soc., n. ser., 15 (1918), No. 34, pp. 431–486, pls. 23; also in Notes Bot. School Trinity Col. Dublin, 3 (1919), No. 1, pp. 3–58, pls. 23*).—A contribution from Trinity College, Dublin, in which descriptions based on variations in microscopic structure are given of a number of samples of mahogany. In order to facilitate the use of the descriptions in distinguishing the various kinds of mahogany, a key is provided which utilizes some of the characteristic microscopic features. The descriptive text is accompanied by a series of plates illustrating wood structure in various samples.

**A. Other methods for field experimentation with Hevea.—B. Some more germination trials with Hevea seed**, J. G. J. A. Maas (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 6, pp. 233–245, figs. 3*).—A discussion of improved methods for field experimentation with Hevea, including data on some additional germination trials with Hevea seed (E. S. R., 41, p. 449).

The present germination tests with Hevea seed confirm the previous results in showing that with seed preserved at ordinary temperatures the packing must be moist but not air tight. When being preserved for periods longer than one month the packing material should be moistened once every three or four weeks. At lower temperatures, from 4 to 8° C. (39.2 to 46.4° F.), the seeds will stand better a drier and more air-tight packing, but even under lower temperatures the germination power decreases quickly under air-tight packing. Merely ensilaging Hevea seeds in the ground appears to be good for preserving seeds on the estate for periods not exceeding one month.

Warm water treatment with water about 50° resulted in the germination energy and germination power being slightly improved. Sprinkling with warm water of 45° improved the rapidity of germination a little, but had no significant influence on the germination power.

**The structure of cell elements in the bark of Hevea brasiliensis**, W. Bobiloff (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 5, pp. 222–231, figs. 7*).—The investigation here reported was conducted primarily with the view of

studying the structure of laticiferous vessels of Hevea, and to ascertain some knowledge about the cytology of this tree in connection with the physiological signification of latex.

The author found that in the laticiferous vessels of Hevea both protoplasm and nuclei occur, but the nuclei are larger than those of other cortex cells. The nuclei are placed in protoplasm where also occur vacuoles. It is concluded that the latex of Hevea is cell sap, which generally occurs in the vacuoles of the laticiferous vessels. Frequently many of the nuclei of the laticiferous vessels unite in one spot, and they have also been observed to pass from one vessel to another through the wall openings.

**Variability in plantation rubber,** C. DE VRIES and W. SPOON (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 6, pp. 246–276*).—Results are given of analyses conducted at the Central Rubber Station, showing the variation in rubber samples collected from a number of estates in the Netherlands Indies.

**The relation between the specific gravity of latex and serum and the rubber content of latex,** C. DE VRIES (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 5, pp. 183–206, figs. 2*).—Results are given of experiments conducted with pure undiluted latex collected from trees under different conditions, such as continued tapping after a period of rest, light or heavy tapping systems, from trees before and after pollarding, from trees given different periods of rest and shallow tapping, and from individual trees.

The tests as a whole show that there is a very close relation between the specific gravity and the rubber content of original latex. For the specific gravity of original serum varying values are to be expected, depending upon the composition of the serum owing to physiological factors, but these variations are within a limited range. Whether the specific gravity of rubber in latex is constant or varies somewhat because of absorption phenomena or changes in the composition of the caoutchouc hydrocarbon remains to be investigated. The rubber content of the original latex is lowered by all factors which put a heavy stress on the trees.

**Tapping experiments on Hevea brasiliensis,** A. W. K. DE JONG (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 6, pp. 277, 278*).—This paper summarizes the results of experiments in which tapping was conducted on a quarter, a third, and a half of the circumference of the tree with one left-hand cut. The experiment was conducted on three different tapping areas. Averaging the results of the three areas, the rubber yield increased from 100 : 114 : 122 as the cut was increased from one-fourth to one-half of the circumference.

**The application of preservatives to renewing bark of rubber,** T. PETCH (*Dept. Agr. Ceylon Leaflet 9 (1918), pp. 4*).—This leaflet summarizes in very condensed form considerable information obtained in experiments to determine what amount of injury would be caused to renewing bark of Hevea by the application of preservatives, a number of which were tested in these experiments.

## DISEASES OF PLANTS.

**Report of associate plant pathologist,** C. D. SHERBAKOFF (*Florida Sta. Rpt. 1918, pp. 68–78, figs. 4*).—The author gives a report on investigations of several diseases of truck crops, among them being a rot of eggplants due to *Phomopsis vexans*, bacterial blight or rot of solanaceous plants, buckeye rot of tomatoes, and damping-off of celery.

In the eggplant seed tests, studies were carried on to determine the probability of the seed carrying infection. The results showed that the introduction of the Phomopsis into the seed bed took place by means of seed which had been contaminated with the fungus. It is thought that the fungus is not a

native of Florida, as a large number of samples of seed were free from infection.

Considerable reliable information in regard to the cause, occurrence of, and plants affected with bacterial blight has been collected, and suggestions have been given for the control of the disease. Many phases of the blight, unknown at present, such as varietal susceptibility of the plants, the effect of soil type and treatment on the disease, etc., are to be thoroughly studied until determined. Comparatively little disease was found among the tomatoes on which the experiment was made, yet the disease was scattered among nearly all of the varieties.

Continued observations, previously reported (E. S. R., 39, p. 457), are being made on buckeye rot of tomato fruit. The work of the past year demonstrated that infection of the fruit takes place through the soil. Since the preliminary report on this disease, a wider distribution of the fungus has been observed.

Reports are also given of the truck disease survey, with brief description of the damage caused by the late, early, and bacterial blights of the Irish potato, nailhead rust of tomato, blackheart of celery, Phomopsis fruit rot of eggplant, Alternaria fruit spot of eggplant, and Cercospora leaf spot of pepper.

**Report of the acting Dominion botanist**, J. H. GRISDALE (*Canada Expt. Farms Rpt. 1918, pp. 38–41*).—Brief summaries are given of the more important lines of work carried on during the year covered by the report.

At St. Catherines, Ont., studies of the white pine blister rust occupied considerable time, and a preliminary investigation was made of a strawberry root disease which appears to have been rather widespread.

At Charlottetown, P. E. I., potato spraying experiments for late blight were continued, and it is held to have been established that not less than four applications of 4:4:40 Bordeaux mixture per season are necessary, though not quite so effective in controlling the disease as six applications. For the control of the blackleg disease of potatoes, experiments have shown that the whole tuber should be treated with disinfectants and not the cut tuber. The disease apparently is not carried over in the soil. Other investigations of potatoes have been continued.

At Fredericton, N. B., the work largely consisted of a series of potato spraying experiments, carried on to determine the increase in yield due to freedom from blight and the number of applications necessary.

At the Brandon, Man., and Indian Head, Sask., laboratories the studies have been mostly on grain rust and other cereal diseases. The principal investigations were made to determine the native and cultivated grasses which act as host plants for the rust, the species of rusts attacking cereals in Western Canada, and the origin of the outbreaks of rust.

**Mycology and plant pathology**, E. J. BUTLER (*Ann. Rpt. Bd. Sci. Advice India, 1916–17, pp. 47–56*).—This includes, besides miscellaneous matters, an account of the chief investigations at Pusa during the year. Plant diseases and pests dealt with include ufra of rice, *Orobanche* spp. on tobacco and other plants (noting certain apparent specializations), Phytophthora investigations, studies on Rhizoctonia and allied fungi, anthracnose of chili and other crops, and sal tree disease.

**Plant diseases**, C. M. HUTCHINSON (*Ann. Rpt. Bd. Sci. Advice India, 1916–17, p. 59*).—The author states in this portion of a more general report that bacterial diseases of wheat, poppy, and citrus plants were under investigation during the year. A memoir on bacterial diseases in wheat was projected, as was also a description of bacterial rot of poppy, which resulted in a blackening and slimy decay of the stem and leaves. Further study was contemplated of citrus canker, which has been known in India for several years, some forms of this

disease having been shown to be due, here as elsewhere, to *Pseudomonas citri*.

**Diseases and animal pests of cultivated plants during 1917 and 1918 in Dutch East Indies**, C. J. J. VAN HALL (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, Nos. 33 (1918), pp. 42; 36 (1919), pp. 49*).—In connection with a discussion of the somewhat unusual weather attending the monsoons of 1916 and 1917, systematic accounts are given for 1917 and 1918 of injury in different sections by diseases and parasitic animals to plants. This is followed by an account of legal measures looking to control of animal pests and plant diseases.

**Biologic specialization in the genus Septoria**, W. S. BEACH (*Amer. Jour. Bot., 6 (1919), No. 1, pp. 1–33, pl. 1, figs. 14*).—A study of the genus Septoria is said to show that certain species are differentiated into biologic forms, the species being limited to a few closely related hosts which they infect vigorously, though in some cases members of two or three related genera are susceptible to the same fungus. The symptoms differ with the hosts and conditions, and for this reason are unreliable in taxonomy. It is stated that *S. malvicola* and *S. fairmani* are identical. *S. convolvuli* as described for the host *Convolvulus arvensis* is said to be biologically, as well as morphologically, distinct from the forms described for the host *C. sepium*, and to be therefore entitled to rank as a distinct species.

**Wheat diseases in Java**, B. PALM (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 34 (1918), pp. 22, pl. 1, figs. 12*).—*Ustilago tritici* and *Gibberella saubinetii* (*Fusarium rostratum*) are said to have appeared recently on wheat in Java, having been imported supposedly with seed grain. Attacks on diseased wheat are noted also as due to *Helminthosporium gramineum, H. geniculatum*, and *Nigrospora panici*. A brief account of control measures is followed by a short list of related publications.

**The control of rust [in Manitoba]**, V. W. JACKSON (*Agr. Gaz. Canada, 5 (1918), No. 10, pp. 974, 975, figs. 2*).—After the 1916 outbreak of wheat rust in Manitoba, which is said to have caused losses aggregating over $100,000,000 to the Western Provinces, methods were adopted to remove causes so far as known. Following a rust conference at the Manitoba Agricultural College in August, 1917, there was a spring drive on the barberry bushes, which were completely eradicated, with the exception of a few kept for experimental purposes. No outbreak occurred on these until artificially inoculated from stubble of wild barley, which seems to be especially susceptible to the rust and its most dangerous carrier. Wheat stubble tied in barberry bushes developed no infection, though wild barley stubble treated in the same way gave a heavy crop of æcidiospores a few days later.

**A disease of flax seedlings caused by a species of Colletotrichum, and transmitted by infected seed**, G. H. PETHYBRIDGE and H. A. LAFFERTY (*Sci. Proc. Roy. Dublin Soc., n. ser., 15 (1918), No. 30, pp. 359–384, pls. 2*).—Attention having been drawn in 1916 to the disease of young flax seedlings in the north of Ireland somewhat similar to that described as yellowing or firing, the authors have studied the disease, isolating a fungus which is claimed to be the cause of the trouble, and which is technically described as a new species under the name *Colletotrichum linicolum*. A detailed account of the symptoms emphasizes the development of spots on the leaves and lesions on the stems, often causing a sort of damping off. The disease somewhat resembles flax canker in the United States attributed to *C. lini*, but more closely the disease of flax ascribed to a Colletotrichum of undetermined species in Holland.

The mycelium hibernates within the epidermal cells of the seed coat, from this source infecting the seedlings during or after germination. Deep planting

reduced the infection somewhat. Disinfection with formalin and with hydrogen peroxid was not completely effective. Treating slightly moistened infected seed with a mixture of finely powdered copper sulphate crystals and dry sodium carbonate suppressed the disease entirely.

**Curtailing potato diseases**, W. A. ORTON (*Potato Mag., 1 (1918), No. 2, p. 12*).—This paper contains a brief account, with discussion, of mosaic and other diseases of potato in the Northern States as related to crop failures in other sections obtaining seed potatoes from such localities, the system of seed certification now in course of development in Northern States, the production of disease-free seed potatoes, and the control of potato diseases by spraying.

**Cooperative spraying [of potatoes for late blight] in Vermont**, B. F. LUTMAN (*Potato Mag., 1 (1918), No. 2, pp. 10, 26*).—This is an account of the organization and operation of an arrangement for community spraying of potatoes, primarily for late blight, in parts of Vermont. A 50-acre unit was employed, and Bordeaux mixture (early at 3:3:50 and later at 4:4:50) was used, from one to four applications being made. A 50 per cent gain in productiveness is claimed. The claim is made also that potato rot was decreased by spraying.

**Is crown gall injurious to apple nursery stock?** S. B. FRACKER (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 133–135*).—The author reports the results of observations by himself regarding the effects of crown gall on apple trees in Wisconsin as related to the size of nursery stock and to fruit production.

In three out of four nurseries discussed, it was found that without respect to variety, the infected trees, if their sale were permitted, would yield (on account of their indicated classification) 17 or 18 per cent less gross returns than would a similar number of noninfected trees, since the infected nurseries show a much larger number of seconds. Although in many cases there seems to be a tendency for the infection to decrease the vigor of the plant without forcing its size below the commercial value, there is a great diminution in the number of first-grade trees when infected and an increased number of seconds, not a single nursery or variety showing as great a proportion of trees of salable size among those having crown gall as in those free from that disease. This reduction in size of apple trees in Wisconsin nurseries is thought to be the direct result of crown gall infection.

**Avocado scab**, H. E. STEVENS (*Florida Sta. Press Bul. 289 (1918), pp. 2*).—An account is given of a new and apparently undescribed disease which has come to the author's attention within the last two years. The disease is characterized by the formation of definite spots or blemishes on young leaves and tender shoots, severe attacks causing the leaves to curl or become distorted. The more mature leaves do not seem to be affected. The fungus, *Cladosporium citri*, is thought to be a strain of the same that causes citrus scab. Spraying with Bordeaux mixture and avoidance of shade and crowded condition of the trees are suggested as means of control.

**Report of plant pathologist**, H. E. STEVENS (*Florida Sta. Rpt. 1918, pp. 62–67, figs. 4*).—The principal disease reported is that of the avocado scab noted above, which received additional investigation. It has been found that strains of the fungus isolated from avocado and from citrus seem to be identical so far as habits of growth and cultural characters are concerned.

A description is also given of a second disease, avocado fruit spotting, which seems to be of fungus origin, although this has not been definitely determined. In some few cases the disease has been observed on the variety Trapp, though the spotting seems to be confined mainly to seedling fruits. About the time the fruit is approaching maturity the disease makes its appearance, the spots being quite evident on the ripened fruit. Spotting in matured fruits often results

in rapid decay. A spotting very similar to that on the fruit has been observed in the green bark of twigs, and a typical leaf spot is frequently associated with the disease.

**A bacterial disease of citrus** (*Cal. Citrogr., 3 (1918), No. 11, p. 273*).—A brief notice of accounts given under the same title by Doidge (E. S. R., 38, pp. 552, 553), also a brief discussion of the cause of the disease (*Bacillus citrimaculans*), its mode of attack, the injury done, and control measures.

**Ustulina zonata on Hevea brasiliensis**, A. Sharples (*Ann. Appl. Biol., 4 (1918), No. 4, pp. 153–178, pls. 6, fig. 1*).—The present contribution deals with dry collar rot of old rubber trees caused by *U. zonata*, as noted by various authors. A previous account (E. S. R., 37, p. 52), economic in its main bearings, is now followed by an outline of observations made since 1914.

The disease is found in old plantations throughout Malaya. Connection is thought to exist between *U. zonata* and attacks on *H. brasiliensis* by boring beetles on trees scorched by forest fires or injured during the process of thinning or during the removal of trees of other species. Apparently this fungus does not readily attack uninjured rubber trees.

Treatments recommended fall in three classes, plantations being divided in this connection into those having young trees not thinned out, those being thinned out but with trees not yet 10 years old, and those having trees over 10 years old. The measures recommended include sanitation, eradication of jungle roots, and removal of old trees.

Further study is regarded as necessary on the rôle played by latex in the metabolism of the tree, and on selection with a view to improving the latex and increasing resistance to attacks by *U. zonata*.

**The European poplar canker in the vicinity of Philadelphia, Pa.**, J. K. Primm (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 129–133*).—In the course of nursery inspection during the summer of 1917 the author found that within a radius of 35 miles of Philadelphia infection of poplars by *Dothichiza populea* had become well established. Trees of all ages were attacked, though the older trees were more often attacked and suffered more severely, owing possibly to pruning operations. Lombardy poplar (*P. nigra italica*) appeared to be more susceptible to this fungus than other species. Trees on private estates were attacked as well as young trees in nurseries. The only nursery that was entirely free from the canker was one that had been sprayed regularly every winter with lime-sulphur. It is thought that omission of the pruning formerly practiced, especially as regards the basal branches, when combined with good drainage will do much to decrease the injury to the poplar trees.

**Daldinia vernicosa, a pyroxylophilous fungus**, A. S. Rhoads (*Mycologia, 10 (1918), No. 6, pp. 277–284, pl. 1, fig. 1*).—A study of *D. vernicosa* on a selected area near State College, Pa., shows this fungus to prefer burnt wood as a substratum. It appears to be confined to dicotyledonous species, attacking saplings killed by fire (especially those of hickory) with great vigor. Morphologically distinct from this species is *D. concentrica*, said to be the only other species of Daldinia in the United States.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Tropical wild life in British Guiana**, W. Beebe, G. I. Hartley, and P. G. Howes (*New York: N. Y. Zool. Soc., 1917, vol. 1, pp. 504, pls. 4, figs. 140*).—Much of this work relates to ornithological observations by W. Beebe and G. I. Hartley, while part 3 (pp. 371–450) deals with entomological investigations by P. G. Howes in which a number of insects of economic importance are included.

**Birds of field, forest, and park**, A. F. GILMORE (*Boston: The Page Co., 1919, pp. XII+318, pls. 40*).—A popular account.

**The birds of North and Middle America**, R. RIDGWAY (*U. S. Nat. Mus. Bul. 50, pt. 8 (1919), pp. XVI+852, pls. 34*).—In continuation of the work previously noted (E. S. R., 35, p. 851), the present volume deals with the families Jacanidæ, Œdicnemidæ, Hæmatopodidæ, Arenariidæ, Aphrizidæ, Charadriidæ, Scolopacidæ, Phalaropodidæ, Recurvirostridæ, Rynchopidæ, Sternidæ, Laridæ, Stercorariidæ, and Alcidæ of the Charadriiformes.

**Notes on North American birds, VIII**, H. C. OBERHOLSER (*Auk, 36 (1919), No. 3, pp. 406–408*).—This is a continuation of the paper previously noted (E. S. R., 40, p. 351).

**The migration of North American birds, VIII, IX**, H. C. OBERHOLSER (*Bird Lore, 21 (1919), Nos. 1, pp. 23, 24; 2, pp. 100–102*).

**Birds of a Washington city dooryard**, H. C. OBERHOLSER (*Amer. Midland Nat., 6 (1919), No. 1, pp. 1–13*).

**Another purple martin roost in the City of Washington**, H. C. OBERHOLSER (*Bird Lore, 21 (1919), No. 2, pp. 96–99*).

**Observations on the shifting range, migration, and economic value of the bobolink**, W. L. MCATEE (*Auk, 36 (1919), No. 3, pp. 430, 431*).—This is a brief account based upon investigations of the present economic status of the bobolink carried on from New Jersey south to Florida, inclusive, from August to October, 1918. The inclusion of this bird among those protected by the recently consummated treaty with Canada for the protection of migratory birds led to a demand for this information. Attention is first called to the fact that the trend of the bobolink's breeding range is to the northwest, British Columbia now being the western limit. The main fall migration route seems to converge into a funnel not far south of the breeding range, through which the birds pour in a narrow stream along the coast of southern North Carolina, South Carolina, and Georgia, expanding again so as to cover the whole breadth of peninsular Florida.

The once decadent rice industry of the South Atlantic States stimulated by war prices resulted in an acreage in 1919 probably in excess of 6,000. The destruction of this by the bobolink or ricebird averages about 25 per cent, a money loss for the rice alone probably in the neighborhood of $150,000. As a result of the investigation, an order has been issued by the U. S. Department of Agriculture permitting the killing of the bobolink in Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia from September 1 to October 30, inclusive, and in the States from Virginia to Florida from August 16 to November 15.

**Eumyias v. Stoporala**, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 32 (1919), p. 47*).

**The status of the subfamily name Fuligulinæ**, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 32 (1919), p. 48*).

**The geographic races of Hedymeles melanocephalus**, H. C. OBERHOLSER (*Auk, 36 (1919), No. 3, pp. 408–416*).

**A revision of the subspecies of Passerculus rostratus**, H. C. OBERHOLSER (*Ohio Jour. Sci., 19 (1919), No. 6, pp. 344–354*).

**Passerherbulus leconteii (Audubon) becomes Passerherbulus caudacutus (Latham)**, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 32 (1919), p. 47*).

**The proper orthography of the generic name Phoethornis Swainson**, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 32 (1919), p. 48*).

**Descriptions of nine North American pikas**, A. H. HOWELL (*Proc. Biol. Soc. Wash., 32 (1919), pp. 105–110*).

The family name of the American wood warblers, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 32 (1919), p. 46*).

A dangerous snail introduced in California, G. R. GORTON (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 1, pp. 7–10, figs. 5*).—The author records the occurrence of *Helix pisana* at La Jolla in San Diego County, where it is confined almost entirely to a small canyon extending upward from the ocean about three city blocks in length, and to some level ground contiguous thereto. Because of its known destructiveness in the Mediterranean region, where it attacks both field and orchard crops, especially the buds and blossoms of citrus fruits, foliage of olives, loquats, etc., attempts are being made to eradicate it.

In an appended note H. S. Smith calls attention to a report by De Stefani[1] on the status of the pest in Sicily.

Report of entomologist, J. R. WATSON (*Florida Sta. Rpt. 1918, pp. 56–61*).—In control work with cyanamid for root-knot nematodes, in continuation of the work previously noted (E. S. R., 39, p. 461), very serious burning resulted, not only to the first crop of celery set out one month after application but to another set out three months after treatment at Sanford and Bradentown. The only explanation of the diversity of results obtained in the two years is that there was a difference in the cyanamid used. Thus it appears that a ton per acre is too heavy a dose to be always safe. No such results were noted in the plats at the station farm even when the material was applied at the rate of 3 tons per acre.

In the experimental work during the year sodium cyanid was used at the rate of 100 to 800 lbs. per acre, followed at once by the application of ammonium sulphate in solution, using 150 per cent of the weight of the sodium cyanid. The results are said to parallel quite closely those obtained with cyanamid and the cost to be considerably greater than that of the latter. "Even 800 lbs. per acre did not entirely exterminate the nematodes, but did reduce their numbers to such an extent that they did not again reach destructive abundance for nearly a year. On the plats receiving 300 lbs. or less per acre there was no noticeable decrease in the number of nematodes."

In experiments with summer fallow for nematode control the results were about equal to those obtained by the use of 600 lbs. of cyanid or a ton of cyanamid per acre.

It was found that the hibernation of *Nezara viridula* is incomplete. Many individuals, however, truly hibernate while others remain all winter on green plants, usually actively feeding although they are quiescent during the coldest weather.

The importation of *Delphastus catalinæ* from California was continued during the year, and in at least three groves the beetles maintained themselves throughout the winter and increased at a satisfactory rate.

Other insects of the year mentioned are a plant bug (*Adelphocoris rapidus*), which attacked cotton squares; the sweet-potato caterpillar (*Prodenia* sp.); the woolly white fly (*Aleurothrixus howardii*), reported for the first time from St. Lucie County; the broad-nosed weevil (*Epicærus formidulosus*), received from Jensen; a slug (*Vaginulus floridensis*), which was a source of considerable damage to tomatoes at Dania; the big yellow plant bug *Corecoris confluentus*, which severely injured tomatoes at Bokelia; the Colorado potato beetle received from Panama City, which is the first report from the Gulf coast of Florida though recorded from many of the northern tier of counties; the bollworm, which mined in the buds of geraniums at Vero; a tree hopper (*Platycorus ½-vittata*), which infested oaks, especially live and water oaks, and was

[1] *Helix pisana* and the Damage Which It is Capable of Doing to Agriculture (Palermo, Sicily, 1913).

more common than usual; and the papaw snout beetle (*Derolomus basalis*), which injured cotton squares, causing them to drop.

**Unusual nursery insects**, H. B. Weiss (*N. J. Dept. Agr. Circ. 24 (1918), pp. 13, figs. 6*).—Brief accounts are given of the minor insect pests met with in New Jersey nurseries. These include the Iris-leaf miner (*Agromyza laterella*), which has damaged Japanese Iris in several New Jersey nurseries; the sinuate pear-tree borer, a large and serious infestation of which was discovered in 1918 in a nursery in the central portion of the State; the white poplar leaf hopper (*Idiocerus cognatus*), first observed at Irvington in the summer of 1917, and since found at several other places in the State, usually on white poplar nursery stock; a European poplar leaf miner (*Zeugophora scutellaris*), which feeds on the foliage of poplar (*Populus deltoides*); the lunate onion fly (*Eumerus strigatus*), which was taken at Rutherford, South Orange, Riverton, and several other places in the State in 1918, these being the first definite records of its occurrence in New Jersey; and the sumac psyllid (*Calophya nigripennis*), which, while not seriously injurious, often attracts attention in nurseries by reason of its abundance on *Rhus copallinum* (E. S. R., 40, p. 754).

**Insects of the season** (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 44 (1918), pp. 15–18*).—This is a brief report of the occurrence of and work with the more important insects of the year.

**Report of the entomologist**, D. T. Fullaway ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry, Hawaii, 1917–18, pp. 54–60*).—This report relates to the propagation and distribution of beneficial insects, etc., for the biennial period ended December 31, 1918.

**Insect and arachnid pests of 1917**, R. S. Macdougall (*Trans. Highland and Agr. Soc. Scot., 5. ser., 30 (1918), pp. 56–96, figs. 20*).—A discussion of the occurrence of and control measures for some of the more important insect and arachnid pests of the year.

**Division of entomology, annual report, 1916–17**, C. P. Lounsbury (*Union So. Africa Dept. Agr. Rpt. 1916–17, pp. 93–105*).—This reports on the inspection, regulatory, and investigational work conducted during the year ended March 31, 1917.

**Economic entomology**, H. H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1917–18, pp. 40–44*).—A discussion of the occurrence of and work with the more important insects of the year.

**Common insects and diseases of the apple**, W. W. Chase (*Ga. Bd. Ent. Bul. 54 (1919), pp. 52, pls. 13, fig. 1*).—This replaces Bulletin 38 previously noted (E. S. R., 29, p. 353).

**The more important insect enemies of the rose mallow in New Jersey**, H. B. Weiss (*N. J. Dept. Agr. Circ. 25 (1919), pp. 9, pls. 4*).—Substantially noted from another source (E. S. R., 40, p. 754).

**Insect pests of stored grains and mill products**, F. H. Lathrop (*Oreg. Agr. Col., Ext. Bul. 228 (1919), pp. 4, figs. 5*).—A brief popular account.

**Insecticides and fungicides**, F. T. Shutt (*Canada Expt. Farms Rpt. 1918, p. 24*).—This brief account relates to the composition of calcium arsenate and calcium arsenite.

Reliable brands of calcium arsenate in the dry powder form contains arsenic equivalent to approximately 40 per cent arsenic oxid, less than 1 per cent of which is soluble in water. One brand analyzed, however, contained 32.75 per cent arsenic oxid. The arsenical content of the paste forms is about half that of the dry powder. Several brands of calcium arsenite showed an arsenious oxid content varying from 14 to 24 per cent. In order that there be no risk of injuring the foliage, it is advised that both the arsenate and arsenite be

used in Bordeaux mixture, lime-sulphur solution, or with an excess of lime in the spray.

**The adulteration of insect powder with powdered daisy flowers (Chrsyanthemum leucanthemum)**, R. C. ROARK and G. L. KEENAN (*U. S. Dept. Agr. Bul. 795 (1919), pp. 12, pls. 2, fig. 1*).—The authors' studies are reported under the headings of adulteration of insect powder and uses, insecticidal action, chemistry, and morphology of the ox-eye or field daisy (*C. leucanthemum*).

It was found that while there are certain differences in the chemical composition of *C. cinerariæfolium* and *C. leucanthemum* a chemical analysis is insufficient to show adulteration of insect powder with daisy flowers. Adulteration of insect powder with powdered daisy flowers can be definitely determined by microscopic examination, the powdered daisy flowers being distinguished by (a) the irregular dark-red fragments of the achene, and (b) the palisade-like cells comprising the costal tissue of the achene.

A list of 40 references to the literature cited is appended.

**Fumigation with liquid hydrocyanic acid**, H. J. QUAYLE (*California Sta. Bul. 308 (1919), pp. 393–407, figs. 4*).—This is a summary of information on the present status of fumigation with liquid hydrocyanic acid, first used largely in experimental tests on citrus trees in California in 1916 and on an extensive commercial basis in 1917. In addition to the scale insects of citrus trees, more than 75,000 ladybird beetles have been used in comparative tests as an index of results. The results have given discriminating data concerning the diffusion of gas under the tent, showing that the place of greatest concentration is practically the reverse of that from the pot or portable generator.

"The greatest possible yield is 108 lbs. or 18.56 gal. of anhydrous liquid hydrocyanic acid from 200 lbs. of sodium cyanid (51 to 52 per cent cyanogen). The amount of liquid hydrocyanic acid (95 to 98 per cent) that has been recovered at the plant during the past year has been about 78 per cent of the total available. The amount of gas evolved by the pot or portable generator is estimated at 90 per cent of the total available gas. During the past year 75 per cent of the gas from a given amount of cyanid in the liquid form was made to cover the same ground as 90 per cent from the same amount by the ordinary methods of generation. Thus, while there has been a discrepancy of 10 or 15 per cent in the actual amount of gas used through the liquid method, the results in the field have not indicated any important difference on the scale insects. Our own tests, however, both in the field and laboratory, have indicated about such difference as would be expected. This apparent discrepancy between our own tests and commercial work in the field may be accounted for through the great variability in field work and by the difference, as has been determined, in the diffusion of the gas from the different methods.

"Field examinations are usually limited to an examination of the scales within 6 or 8 ft. of the ground. Our own tests have included the top of the tree as well. From these tests, when the results at the center and the bottom only were considered, there was practically no difference between the liquid and the pot, which harmonizes with the results in the field. When the results at the center and top only were considered, the pot method was more efficient than the liquid method. When the results in all parts of the tree are considered, it is necessary to use about 20 cc. of liquid hydrocyanic acid (96 or 98 per cent) to equal 1 oz. of sodium cyanid as given in the schedules of dosage now in practical use. Units representing 20 cc. may therefore be submitted for the ounces, and the atomizing machines should be graduated to deliver 20 cc. from each ounce called for in the schedules."

An account relating to this subject by Woglum has been previously noted (E. S. R., 41, p. 164).

**Liquid hydrocyanic gas for fumigation** (*Cal. Cult., 53 (1919), No. 1, p. 3, fig. 1*).—This brief account includes a dosage schedule table for citrus tree fumigation with liquid hydrocyanic acid 95 to 98 per cent pure, prepared by R. S. Woglum of the Bureau of Entomology of the U. S. Department of Agriculture.

**The treatment of cloth to prevent mildew**, A. W. Morrill and W. W. Yothers (*Proc. Fla. State Hort. Soc., 31 (1918), pp. 81–85*).—This is a report of experiments in Florida conducted by the authors on mildew proofing canvas during the summer and fall of 1908.

Considering the cost and efficiency, the authors recommend the use of any of 3 of the 13 solutions tested, namely (1) sal soda 7.5 lbs., tartaric acid 15 oz., and zinc sulphate 7.5 lbs.; (2) copper sulphate 7.5 lbs. and sal soda 7.5 lbs.; and (3) copper sulphate 7.5 lbs., sal soda 7.5 lbs., and tartaric acid 15 oz., each being sufficient to make 300 gal.

**The care of spraying machinery**, W. W. Yothers (*Proc. Fla. State Hort. Soc., 31 (1918), pp. 77–80*).

**Two new genera and thirteen new species of Australian Thysanoptera**, J. D. Hood (*Proc. Biol. Soc. Wash., 32 (1919), pp. 75–92*).—The genera erected are Asemothrips and Teuchothrips.

**Some plant bugs that infest citrus trees**, W. W. Froggatt (*Agr. Gaz. N. S. Wales, 30 (1919), No. 5, pp. 325–330, figs. 2*).—Notes are presented on the natural food plants and life histories of several of the plant bugs infesting citrus trees in Australia, including the green-spined orange bug (*Biprorulus bibax*), the painted Capparis bug (*Stenozygum personatum*), and the painted horehound bug (*Agonoscelis rutila*).

**The genus Phatnoma**, E. H. Gibson (*Trans. Amer. Ent. Soc., 45 (1919), No. 2, pp. 181–185*).—Seven species of this tingid genus, which is of little economic importance, are recognized, of which two are described as new.

**The genera Corythaica Stål and Dolichocysta Champion (Tingidæ: Heteroptera)**, E. H. Gibson (*Proc. Biol. Soc. Wash., 32 (1919), pp. 97–104*).

**Notes on the North American species of Corizus**, E. H. Gibson (*Canad. Ent., 51 (1919), No. 4, pp. 89–92*).—This account includes a key for the identification of the species, of which 12 are recognized.

**Cicadula sexnotata, a hemipteran injurious to wheat, oats, and barley in Sweden**, T. Ellinger (*Vort. Landbrug, 37 (1918), No. 40, pp. 453, 454; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 11, p. 1383*).—This pest caused serious damage to wheat in the Province of Östergötland, and spread into southern Sweden as far as Scania during the summer of 1918.

**Third contribution to the knowledge of Italian Coccidæ**, G. Leonardi (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 12 (1917), pp. 188–216, figs. 13*).—This paper describes 25 species, of which 6 are new to science.

**An interesting reaction to louse bites**, W. Moore (*Jour. Amer. Med. Assoc., 71 (1918), No. 18, pp. 1481, 1482*).—In this contribution from the Minnesota Experiment Station the author presents evidence to show that the clothes louse (*Pediculus humanus [vestimenti]*), if present in large numbers, may produce an illness by a toxin introduced at the time of feeding. It is suggested that some of the symptoms of trench fever encountered in certain cases may not be due to the organism of trench fever but to certain toxins introduced by the lice.

**Clinical studies on the effects of louse bites, Pediculus corporis**, A. D. Hirschfelder and W. Moore (*Arch. Int. Med., 23 (1919), No. 4, pp. 419–430, figs. 4*).—In continuation of the investigations by Moore above noted, the authors record observations which indicate more strongly the presence of a

substance in the louse sufficiently toxic to give rise to a generalized skin eruption and mild fever. The details of four cases are reported.

**The biology of Pediculus humanus**, G. H. F. NUTTALL (*Parasitology, 11 (1919), No. 2, pp. 201–220, pl. 1, fig. 1*).—These notes, supplementing the monographic account previously noted (E. S. R., 38, p. 765), deal with color and light reactions; the influence on lice of temperature conditions in clothing and the absorption of radiant heat by cloth; the influence of black, white, and colored backgrounds and of colored screens upon pigmentation in lice, proving that pigmentation is not hereditarily transmitted; and the relative proportions of the sexes.

**Report on typhus conditions in native dwellings**, C. K. BRAIN (*Union So. Africa, Dept. Agr. Local Ser. 57 (1919), pp. 20, pls. 4*).—This is a report of an investigation conducted in the native territories and eastern Cape Province, where the fever now recognized as typhus has existed for at least 30 years and where, between the early part of 1916 and October, 1917, a widespread epidemic occurred. The investigations have led to the conclusion that the disease is identical with European typhus and that the chief means of transmission is the body louse.

**Notes on the tussock moth (Hemerocampa vetusta gulosa) in British Columbia**, W. B. ANDERSON (*Agr. Gaz. Canada, 6 (1919), No. 2, p. 139*).—The author records the devastation of a grove of young Douglas fir (*Pseudotsuga mucronata*) at Hedley in the Similkameen Valley, B. C., by *H. vetusta gulosa*.

**The European corn borer**, J. S. HOUSER (*Mo. Bul. Ohio Sta., 4 (1919), No. 6, pp. 185–190, figs. 8*).—A brief summarized account, in which attention is called to the importance of the pest.

**The history of the codling moth in British Columbia**, R. C. TREHERNE (*Agr. Gaz. Canada, 6 (1919), No. 1, pp. 19–24, fig. 1*).—This discussion includes an account of investigations conducted by the Dominion entomologist during 1916, 1917, and 1918.

**Some characteristic differences in the pink bollworm and Pyroderces simplex**, R. AVERNA-SACCÁ (*Bol. Agr. [Sao Paulo], 19. scr., No. 8–12 (1918), pp. 656–665, figs. 4*).—The differentiation of these species is discussed.

**Physiological and parasitological studies of economic Lepidoptera**, C. GAUTIER (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 22, pp. 1152–1155*).—In this article, which is in continuation of previous studies (E. S. R., 40, p. 263), the author deals with the oviposition of *Apanteles glomeratus*, which is parasitic on *Pieris brassicæ*, the eggs normally being deposited in the small caterpillar.

**Coccobacilli parasites of the caterpillar of Pieris brassicæ**, A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 9, pp. 476–478*).—The author has found five species of coccobacilli to infect *P. brassicæ* caterpillars, four of which occur in the Lyonnais region and one at Sellières in Jura. The characteristics of these species, namely, *Bacillus pieris fluorescens, B. pieris liquefaciens, B. pieris nonliquefaciens α, B. pieris nonliquefaciens β, and B. pieris agilis*, are described.

**The Argentine fruit fly (Anastrepha fraterculus)**, P. CARIDE MASSINI and J. BRÉTHES (*An. Soc. Rural Argentina, 52 (1918), No. 5, pp. 273–276, fig. 1*).—A brief account of this fruit fly, a more detailed account of which by Rust has been noted (E. S. R., 40, p. 756).

**A contribution to the study of the black fig fly (Lonchæa aristella) and its parasites in the Sorrento peninsula of Italy**, L. SAVASTANO (*Ann. R. Staz. Sper. Agrum. e Frutticol. Acircale, 4 (1916), pp. 113–146, pls. 2; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 6, p. 773*).—

A report of the author's studies of this pest, which is the source of much damage in Italy.

The maize leaf miner (Phytomyza sp.), C. H. Knowles (*Fiji Dept. Agr. Pamphlet 27 (1917), pp. 2; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 11, p. 475*).—It is reported that under certain conditions this leaf miner is capable of affecting corn plants to such an extent as to prevent a crop being raised.

The eggs of this miner are laid in the upper surface of the corn leaf, generally near the tip and in the young leaves, each egg being deposited singly in a small hole that is first made in the leaf. "The larvæ upon hatching burrow into and consume the green cellular matter of the leaf, keeping just under the upper epidermis, which dies and shows a white streak indicating the tracks of the larvæ. The mines generally run toward the tip of the leaf. When mature, the larvæ eat through the thin upper epidermis and escape for pupation."

Lonchæa aristella, a dipteran injurious to the flowers and fruit of the caprifig and the fig, F. Silvestri (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 12 (1917), pp. 123–146, figs. 19; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 6, pp. 773, 774*).—This account relates to a lonchæid which is the source of much injury to figs in the Sorrento Peninsula, especially in Vico Equense, Italy.

The susceptibility of anophelines to malarial infections in Netherlands India, N. H. Swellengrebel, W. Schüffner, and J. M. H. Swellengrebel de Graaf (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 3 (1918), pp. 1–64, pls. 3; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 23, p. 1712*).—A report of investigations by the authors of the mosquito hosts of malaria in the Netherlands Indies, in which it is pointed out that the experimental index of infectability is very high in *Myzomyia ludlowi*, which is a true house mosquito.

"Contrary to other observers one can not but consider *M. ludlowi* to be a potent carrier. . . . In the districts where the researches were undertaken and during the periods of observation it was the most important transmitter of all anophelines examined."

The cost of malaria.—A study of economic loss sustained by the Anderson-Cottonwood Irrigation District, Shasta County, Cal., H. F. Gray (*Jour. Amer. Med. Assoc., 72 (1919), No. 21, pp. 1533–1535*).—The author presents data on the economic loss caused by malaria in this irrigation district in 1918, where *Anopheles maculatus* and probably *A. punctipennis* are present. Estimates are given on the loss occasioned and the cost of control measures.

Mosquito control about cantonments and shipyards, J. A. Le Prince (*Pub. Health Rpts. [U. S.], 34 (1919), No. 12, pp. 547–553*).—A brief statement of the work accomplished.

The mosquito problem in Britain, A. C. Parsons and G. R. Brook (*Jour. Roy. Army Med. Corps, 32 (1919), No. 1, pp. 1–23*).—A discussion of the problem, with suggestions for a winter campaign against the important mosquitoes and notes on insecticides.

A few general directions with regard to destroying mosquitoes, particularly the yellow fever mosquito, W. C. Gorgas (*Washington: War Dept. [U. S.], Med. Dept., 1918, pp. 14*).—The author calls attention briefly to the leading points in our present knowledge of this subject.

Fishes in relation to mosquito control in ponds, S. F. Hildebrand (*Pub. Health Rpts. [U. S.], 34 (1919), No. 21, pp. 1113–1128, pls. 6, figs. 3*).—This is a report of investigations of the value of the top minnow (*Gambusia affinis*) in antimalarial work.

"*G. affinis* is especially suitable for antimosquito work because (a) it seeks its food at the surface, (b) it is very prolific, (c) it gives birth to well-developed young, therefore requiring no special environment for depositing and hatching the eggs, (d) it lives and thrives under a large variety of conditions and frequents areas especially suitable for the support of mosquito larvæ, [and] (e) it usually lives and multiplies in ponds stocked with predacious fishes, providing it has very shallow water for refuge."

**The comparative effectiveness of certain culicifuges under laboratory conditions**, A. BACOT and G. TALBOT (*Parasitology, 11 (1919), No. 2, pp. 221–236, fig. 1*).—A detailed report of investigations of the comparative efficiency of culicifuges conducted for the British War Office.

"For the purpose of testing culicifuges, numbers of *Stegomyia fasciata* (the yellow fever mosquito) bred in incubators were placed in cages kept in the laboratory. The efficiency of the preparations was tested by coating the forearm with a definite quantity of one or other of them and exposing in a cage, each test being controlled by inserting after a short interval the other and untreated arm in the same cage, the number of bites being compared in each case. By this procedure it was hoped to obtain a measure of the relative protection which the culicifuges might be expected to afford when used under practical conditions against Anopheles mosquitoes.

"In the first series of trials, conducted within 15 minutes of application, 8 preparations out of a total of 22 tested gave satisfactory results. Their active ingredients were (1) oil of cassia and camphor, (2a) oil of cassia and peppermint, (5) oil of eucalyptus and citronella with phenol, (9a) crude naphthalin (coke oven) and camphor, (10) crude 'Parasitox,' (15a) light wood oil, (21) oil of turpentine, (22a) 'Lawson's Anti-mosquito Compound.' These preparations were then tested to ascertain for what period their protection could be depended upon. Preliminary trials indicated that this period was not likely to extend for more than two hours between treatment of the arm and exposure in the cage. None of the preparations gave complete protection in this series of trials."

**The tobacco flea-beetle**, Z. P. METCALF and G. W. UNDERHILL (*North Carolina Sta. Bul. 239 (1919), pp. 47, figs. 34*).—A detailed report of studies of the biology and control of the tobacco flea-beetle (*Epitrix parvula*), the most important insect enemy of tobacco occurring in North Carolina.

The adult is the source of most of the injury to tobacco, this injury being characterized by small, round, or irregular feeding punctures scattered over the leaf surface or by a more or less complete skeletonization of the leaf. It was found that a beetle consumes an average of 10.3 times its own weight per day.

The species, which apparently occur in the United States wherever tobacco is grown, is rather widely distributed in the tropical and temperate regions of the world. It feeds by preference on any and all of the members of the Solanaceæ. The adults, in which stage the winter is passed, emerge early in the spring and the damage which they cause to tobacco beds is usually very extensive. The eggs are laid from April to September, on or very near the surface of the ground immediately under the host plant at an average rate of 2.21 per day for a period of, assumed as, at least 90 days. They hatch in from 6 to 8 days in midsummer. In a study of the larvæ in the field they were found to feed upon the roots of the plants of the solanaceous family, none ever being found feeding upon the leaves. In special cases it was found that they not only feed upon but often tunnel the stalks of tobacco and ground cherry plants for a distance of several inches. In the field they were normally

found only in the ground within a radius of 10 or 12 in. of the plants, feeding on the fine rootlets. The exact length of the larval stage from hatching to pupation has not yet been determined, although every method that could be devised was tried out. However, larvæ were kept under laboratory conditions for 12 days and reached an average length of 4 mm. but all died before pupating, while larvæ of the same average size collected in the field and placed in breeding cages pupated in from 4 to 5 days, making a total of from 14 to 16 days, which figures are approximately the same as those obtained by Chittenden in 1899. The transformation to pupa takes place in a simple, crude pupal cell about 0.5 to 1 in. deep in the soil, the first pupa having been found in the field on July 16 and the last on October 3. The average length of the pupal stage was found to be 4.46 days.

In dealing with control measures, special emphasis is laid upon three methods of attack: (1) The control of the insect on the plant in the bed, (2) the control of the insect at transplanting time, and (3) the destruction of the suckers after the crop is harvested. But little emphasis is placed upon the spraying of the plants in the field, since this method will not be necessary if the other methods are followed. The plant beds should be provided with a good board frame and a tight beetle-proof cover of the best canvas or cheesecloth. It is recommended that the plant beds be sprayed with arsenate of lead (paste) at the rate of 1 lb. to 10 gal. of water, or with arsenate of lead (powdered) or arsenate of lime at the rate of 1 lb. to 20 gal. of water, or the plants be dusted with powdered arsenate of lead or arsenate of lime mixed with fine sifted wood ashes at the rate of 1 lb. of the poison to 4 lbs. of the ashes. At transplanting time the plants should be dipped in a solution of arsenate of lead, prepared by mixing arsenate of lead (1 lb. paste or 0.5 lb. powder) in 5 gal. of water.

An account of this pest by Morgan has previously been noted (E. S. R., 23, p. 465).

**Controlling asparagus beetles**, T. L. Guyton (*Mo. Bul. Ohio Sta., 4 (1919), No. 6, pp. 197–199, figs. 2*).—A brief popular account.

**The passion vine longicorn beetle (Monohammus fistulator)**, C. French, jr. (*Jour. Dept. Agr. Victoria, 17 (1919), No. 2, pp. 117–119, figs. 4*).—A brief account of this borer, which is fairly common in many parts of Victoria, based upon a paper by Froggatt previously noted (E. S. R., 40, p. 654).

**Notes on the life history and early stages of Brachys ovatus and B. ærosus**, H. B. Weiss and A. S. Nicolay (*Canad. Ent., 51 (1919), No. 4, pp. 86–88, pls. 2*).—The authors record observations of the biology of two species of buprestids, the larvæ of which are leaf miners, particularly in oak.

**The native lime tree borer (Citriphaga mixta)**, W. W. Froggatt (*Agr. Gaz. N. S. Wales, 30 (1919), No. 4, pp. 261–267, figs. 4*).—This is an account of a borer which badly damages the wild lime tree (*Atlantia glauca*). It represents a new genus and species, which are described by A. M. Lea as *Citriphaga mixta*.

**The wood borer and its control**, A. H. Cockayne (*Jour. Agr. [New Zeal.], 18 (1919), No. 4, pp. 198, 199, fig. 1*).—A brief account of *Anobium domesticum*, which is the source of considerable destruction to various timbers in New Zealand, being extremely partial in its attack to the New Zealand white pine and kauri.

**A contribution to the knowledge of Coeliodes ruber in Italy**, F. Silvestri (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 12 (1917), pp. 155–174, figs. 14; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 5, pp. 647, 648*).—A great loss of hazelnuts at Vico di Palma Campania, Province of Caserta, in 1914, led to the investigations in the Nola and

Avellino districts here reported. The most serious damage was caused to the petiole and the axis of the buds. An account is given of the morphology and biology of this weevil, which is only known to attack hazel trees.

**Catalogue of species of Curculionidæ of the Cholina group**, A. DA COSTA LIMA (*Arch. Escola Sup. Agr. e Med. Vet.* [*Pinheiro, Rio de Janeiro*], *1* (*1917*), *No. 1, pp. 35–99*).—The author recognizes 311 species and 34 genera.

**Report of the apiarist**, F. W. L. SLADEN (*Canada Expt. Farms Rpt. 1918, pp. 41–43*).—This report includes a summary of the average production of apiaries at 16 of the experimental farms since 1913. The average weight of honey production per colony, spring count, varied from 21.8 lbs. at Sidney, B. C., to 106.7 lbs. at Ottawa, Ont., while the value of production per colony, honey and bees, after deducting winter loss varied from $1.51 at Charlottetown, P. E. I., to $18.31 at Lethbridge, Alta. Alsike and white clover were the principal sources of honey at all the farms except Lethbridge, where it came from alfalfa, which also gave much of the yield at Summerland, B. C.

The general conclusion drawn from the data obtained is that bees can be kept with profit in the regions served by all the experimental farms, but that eastern Canada offers better opportunities than western. Experiments have been started with fireweed (*Epilobium angustifolium*), which is said to be the most promising honey plant for commercial beekeeping at altitudes and latitudes higher than those at which clover gives best results. An attractive and inexpensive paper container for granulated honey has been devised at the Central Experimental Farm to meet the increased cost and scarcity of tin containers.

**Trial of a system of keeping two queens in a hive**, F. W. L. SLADEN (*Agr. Gaz. Canada, 6* (*1919*), *No. 2, pp. 134–136, figs. 3*).—In an attempt to meet the great need for a sure method of preventing swarming without much labor, the author devised a system which has been tried on a small scale during 1918, in which two queens are kept in one hive during 11 months of the year. The trial has shown the system to be workable, and preparations have been made for a more extensive test in 1919.

"Two young queens separated by a double wire-cloth screen were wintered in one hive in the cellar in 1917–18. During the honey flow from dandelion, the bees and queen on one side of the screen were transferred to a separate hive; thus the desire to swarm at this time was not allowed to develop, and there was an uninterrupted and steadily increasing production of young bees from the two queens, with the result that two strong colonies were obtained in time for the opening of the honey flow from clover. The number of bees produced much [exceeded] the number that was obtained in hives that began the season with only one queen, [and] 480 lbs. of honey were produced by these bees.

"In order to prevent swarming during the clover honey flow and to again get two young queens in each hive (all the following stages were carried out in several colonies), the old queen was removed from the brood chamber at the commencement of this honey flow, and 8 days later all queen cells were destroyed except two, one on each side of the wire-cloth division then inserted. A special portico fixed in front of the hives separated the entrance of each half of the hive from that of the other by about 9 in., to prevent the queens that emerged from the cells from meeting after returning from their mating flights. No swarming took place."

**How the female Blastophaga works**, I. J. CONDIT (*Fig and Olive Jour., 4* (*1919*), *No. 1, pp. 9, 12, 13*).—An account of observations of the female *Blastophaga grossorum* in California.

## FOODS—HUMAN NUTRITION.

**A selective bibliography on dehydrated foods**, E. D. GREENMAN (*Spec. Libraries, 10 (1919), No. 4, pp. 108–118*).—This is a bibliography of 370 references classified under the following headings: General; apparatus; fruits, including general, apples, apricots, prunes, pears, etc., bananas, figs, raisins, berries; vegetables; potatoes; milk; eggs; and meat.

**An aerobic spore-forming bacillus in canned salmon**, A. C. HUNTER and C. THOM (*Jour. Indus. and Engin. Chem., 11 (1919), No. 7, pp. 655–657*).—Bacteriological examination, at the Bureau of Chemistry, U. S. Department of Agriculture, of 530 cans of salmon representing 9 brands showed 237 unsterile cans, 224 of which were found to contain the same organism either in pure culture or in connection with other species. The organism, thought to be a member of the mesentericus group, was an obligate aerobic spore-former, gram positive, and motile. Its most characteristic feature was the production of a dark red ring about half an inch below the colony when grown on solid carbohydrate media. When sterile fish was present in the medium, the red color was often imparted to it and a marked softening of the fish took place.

Only 13 of the unsterile cans showed active spoilage, indicating that the bacteria in most cases were in a dormant state while in the can and would grow only when more favorable conditions were supplied. Several of the sterile cans showed spoilage, indicating that sterility is not to be confused with fitness for food.

The authors state in conclusion that "actual sterility is very properly the aim of the packer. The survival of viable organisms in the final product may occasionally be unavoidable, but calls for a careful survey of their source and significance with a view to their complete destruction."

**The nutritive value and cost of some important vegetables**, M. RUBNER (*Berlin. Klin. Wchnschr., 53 (1916), No. 15, pp. 385–390*).—A detailed study is reported of the nutritive value of the edible portion of several winter vegetables and fruits with relation to their cost. Analytical data are given on the composition of apples, rutabagas, beets, horse-radish, comfrey, turnips, red cabbage, carrots, savoy, Brussels sprouts, hazelnuts, kale, edible Boletus, and spinach.

**Nutritive value of the carob bean**, M. E. JAFFA and F. W. ALBRO (*California Sta. Bul. 309 (1919), pp. 441–450, figs. 2*).—Analyses of carob bean (*Ceratonia siliqua*) pods and seeds are reported, and their nutritive value is discussed. The average of the analyses is summarized in the following table:

*Composition of carob bean pods and seeds.*

| Product. | Water. | Protein. | Ether extract. | Sugars. | | Nitrogen-free extract. | Crude fiber. | Ash. |
|---|---|---|---|---|---|---|---|---|
| | | | | Reducing. | Sucrose. | | | |
| | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* |
| Pods and seeds | 13.28 | 6.75 | 2.17 | 11.08 | 19.44 | 39.80 | 9.29 | 2.57 |
| Pods | 11.50 | 4.50 | 2.37 | 11.24 | 23.17 | 36.30 | 8.78 | 2.72 |
| Seeds | 11.74 | 16.46 | 2.50 | ..... | ..... | 58.61 | 7.50 | 3.18 |

Because of the richness of the carob bean in sugar, the use as human food is suggested of those varieties which show a minimum of crude fiber. "Excellent use could be made of the powdered carob pod by those who need more roughage than that supplied by the ordinary diet."

It is also considered that larger use could be made of it as a feeding stuff. A 13-week trial by F. W. Woll at University Farm, Davis, is noted in which carob bean pods were compared with ground barley as supplements to ground milo maize (1:1) for skim milk calves. The calves relished the pods greatly, and 0.4 lb. practically offset 0.35 lb. ground barley.

**Pumpkin as flour substitute**, E. ALPERS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 11–12, pp. 281, 282*).—Satisfactory bread was made with the use of from 10 to 20 per cent of the thick pulp of cooked pumpkin in place of a corresponding amount of flour. The pumpkin gave a slight yellow color and characteristic flavor to the bread, but was thought to be superior to beets as a flour substitute.

**Reports of storage holdings of certain food products during 1918**, J. O. BELL (*U. S. Dept. Agr. Bul. 792 (1919), pp. 80, figs. 40*).—This is the third bulletin in the series previously noted (E. S. R., 41, p. 66). It reports data as to the storage holdings during 1918 of frozen and cured meats, lard, frozen fish, cured herring, and mild cured salmon.

**Swiss food book** (*Schweizerisches Lebensmittelbuch. Bern: Schweiz. Ver. Analyt. Chem., 1917, 3. rev. ed., pp. XXVII+420*).—This is the third revised edition, edited by the Swiss Society of Analytical Chemistry, of methods of investigation and standards of valuation of foods, household utensils, and commodities. Among the food products treated are milk and dairy products, edible fats and oils, meats, cereal products, eggs, honey, sugar and confectionery, fruit products, spices, nonalcoholic and alcoholic beverages, and vinegar.

**Dependence of the protein requirement on the mineral metabolism**, C. RÖSE and R. BERG (*München. Med. Wchnschr., 65 (1918), No. 37, pp. 1011–1016; abs. in Chem. Abs., 13 (1919), No. 11, p. 1222*).—This is a discussion of the maintenance of neutrality in the body, based largely upon metabolism experiments.

The protein requirement was found to be at a minimum if the experimental ration contained a sufficient excess of bases during the fore-period and time of the experiment itself. Insufficient bases during the fore-period and a sufficient excess during the main period were found to increase the protein requirement during the latter period from 5 to 20 per cent, while a sufficient excess during the fore-period and deficiency during the main period increased the protein requirement from 10 to 50 per cent. An insufficient excess of bases during both periods increased the protein requirement from 50 to 300 per cent.

On a diet rich in acid-forming elements the energy utilization was found to be less, and consequently the energy requirement greater, than on a diet rich in base-forming elements. For this reason, it is considered necessary in the determination of the protein requirement to consider whether the ration is rich in acid-forming or in base-forming materials.

**Accessory factors of growth and equilibrium: Vitamins; auximones**, G. SCHAEFFER (*Bul. Inst. Pasteur, 17 (1919), No. 1, pp. 1–21, figs. 6; 2, pp. 41–59, figs. 4*).—This is a review and discussion of the literature on vitamins, symbiotes, and auximones. A bibliography of 44 titles covering the literature on the subject during 1917–18 is appended.

**A lecture on the practical importance of vitamins**, F. G. HOPKINS (*Brit. Med. Jour., No. 3043 (1919), pp. 507–510*).—A general discussion of the subject.

Vitamins and fungi, G. LINOSSIER (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 11, pp. 381–384*).—The author has found that *Oïdium lactis*, although capable of developing on media exclusively composed of mineral substances and a simple carbohydrate-forming food such as alcohol, acetic acid, glycerin or glucose, is sensitive to the action of vitamins. This sensitiveness is

of fat-soluble A in the diet of the adult and the connection between the metabolism of fat-soluble A and the fat of the diet.

The need of the organism for vitamins is apparently proportional to the decrease in vitality, after a certain point the organism being incapable of developing in a medium containing no vitamins. In full activity, however, the organism seems to have the power of existing without vitamins or of synthesizing them.

**The lipoids as indispensable constituents of food.** W. Stepp (*Ztschr. Biol., 66 (1916), No. 9, pp. 365–386; abs. in Zentbl. Biochem. u. Biophys., 19 (1918), No. 14–15, p. 398*).—The author's earlier experiments (E. S. R., 31, p. 861) have been repeated, using white mice again as the experimental animal and dog biscuit from which the lipoids had been extracted with alcohol and ether as the basal diet.

It was found that prepared dog biscuit alone, dog biscuit with lipoids, and dog biscuit with a vitamin preparation (orypan) were inadequate for nutrition, but that the combination of dog biscuit, pure lipoids, and vitamins produced satisfactory growth. In the opinion of the author this indicates the indispensability of lipoids for nutrition.

**Researches on the fat-soluble accessory substance. I–II.** J. C. Drummond (*Biochem. Jour., 13 (1919), No. 1, pp. 81–102*).—Two papers are presented:

I. *Observations upon its nature and properties* (pp. 81–94).—The standardized method adopted by the author in testing substances for the presence of fat-soluble A is as follows: Young healthy rats selected from home bred stock and weighing about 50 gm. each are fed upon an artificial ration consisting of purified casein 20 parts, purified starch 50, salt mixture 5, yeast extract (source of water-soluble B) 5, butter fat (source of fat-soluble A) 15, and filtered orange juice (source of water-soluble C) 5 parts. The rats which give evidence of a normal power of growth are removed from the complete ration when they have attained an average body weight of 70 to 80 gm., and are given a similar dietary in which the butter fat has been replaced by an equivalent amount of hardened linseed oil which is known to be deficient in fat-soluble A. When it is definitely established that growth is inhibited by this deficiency of fat-soluble A, the linseed oil is wholly or partially replaced by the substance to be tested and the behavior of the animal closely watched for a period of from 4 to 6 weeks. Absence of fat-soluble A is indicated by failure to grow, followed by a decline in health accompanied by the characteristic eye condition.

The results obtained in a study of the properties of fat-soluble A according to the above method are summarized as follows:

Fat-soluble A, present in certain oils such as butter fat and whale oil, is readily destroyed by exposure for one hour to a temperature of 100° C., by exposure for a longer period of time to temperatures ranging from 50 to 100°, and by exposure for several weeks to a temperature of 37°. The destruction is apparently not a result of oxidation or hydrolysis.

Fat-soluble A is not extracted from oils by water or dilute acid, but is soluble in alcohol and may be removed in small quantity from oils by cold extraction with alcohol. Hydrolysis of oils in a nonaqueous medium at room temperature causes disappearance of fat-soluble A.

In regard to its composition, fat-soluble A has not been identified with any of the recognized components of fats such as glycerol, saturated or unsaturated fatty acids, cholesterol, lecithin, phosphatids, or lipochromes. No evidence has been obtained to suggest that it is not a single substance, but indications point to its being a labile substance of ill-defined constitution.

II. *Observations on its rôle in nutrition and influence on fat metabolism* (pp. 95–102).—The studies reported in this paper concern the indispensability

of fat-soluble A in the diet of the adult and the connection between the metabolism of fat-soluble A and the fat of the diet.

Feeding experiments conducted according to the method described above indicate that the adult animal organism requires a regular supply of fat-soluble A which is much smaller than the requirement of the young growing animal, but is an important factor in the maintenance of health. "It appears probable that the resistance to diseases of bacterial origin is seriously impaired by a failure of the animal to obtain a sufficient supply of the fat-soluble factor. There is therefore every reason that great care should be taken to insure that dietaries of adults contain an adequate supply of foodstuffs in which fat-soluble A is present."

The symptoms associated with a deficiency of fat-soluble A appear in comparable groups of rats after the same period of time whether the diet contains neutral fat or not. This, together with the fact that fatty acids are absorbed and synthesized into fats, and fats are absorbed in the absence of fat-soluble A, is thought to indicate, indirectly, that pure neutral fats may be dispensable components of the diet.

**Note on the rôle of the antiscorbutic factor in nutrition,** J. C. DRUMMOND (*Biochem. Jour., 13 (1919), No. 1, pp. 77–80*).—Feeding experiments with rats through two generations are reported, which confirm the conclusions reported by Harden and Zilva (E. S. R., 41, p. 171) that "the rat requires the antiscorbutic factor in order to achieve a normal development, and that although the requirements of this species are of a very much smaller order than those exhibited by man, the monkey, or the guinea pig, they are sufficiently well marked to dispel any idea that there exists a fundamental difference in the nutritive requirements of the two types of animal.

"It may therefore be accepted as experimentally proven that the dietary requirements of the higher animals include in addition to a satisfactorily balanced ration of protein, fat, carbohydrate, and mineral salts, an adequate supply of three accessory food factors: Fat-soluble A, water-soluble B or antineuritic factor, and water-soluble C or antiscorbutic factor."

**The antiscorbutic property of fruits.—I, An experimental study of dried orange juice,** M. H. GIVENS and H. B. MCCLUGAGE (*Amer. Jour. Diseases Children, 18 (1919), No. 1, pp. 30–41, figs. 4*).—Dried orange juice was tested for antiscorbutic properties by means of feeding experiments with guinea pigs, the basal diet being that described in an earlier study (E. S. R., 40, p. 762). The orange juice was dried in two different ways as follows:

For one product, the juice was expressed from the oranges and strained through several layers of cheese cloth until a clear filtrate was obtained. This was concentrated to about two-thirds the original volume by heating in the drier at from 55 to 60° C., using 100 cc. portions in small shallow dishes. Soy bean flour, previously heated under 20 lbs. pressure for one-half hour, was then added in the proportion of 12 gm. to 100 cc. of the original juice and mixed thoroughly. The mixture was kept in the drier at from 55 to 60° until thoroughly dried, the whole process requiring about 50 hours.

For the other product, the juice was dehydrated by a commercial process employed for making milk powder. The juice was pressed from the oranges, strained, mixed with corn sirup, and dried by spraying into a chamber kept at from 75 to 80° C. In this process the juice was dried almost instantaneously.

The results obtained with these products as antiscorbutics indicate that experimental scurvy in the guinea pig can either be averted or cured by the use of a small amount of dried orange juice, the size of the dose depending upon the manner of drying the juice. With the second product, a dose equivalent to 3

cc. of fresh juice was sufficient, while with the first a dose equivalent to 6.25 cc. of fresh juice was inadequate as a preventive of scurvy. When the dose was doubled, however, the animals were cured and protected against a recurrence of the disease. Both products retained their antiscorbutic properties after three months' storage.

The conclusion is drawn that the most satisfactory process for drying orange juice is one in which the temperature of drying is not unduly high and the duration of drying is very short. The possibility is suggested of using dried orange juice as a convenient antiscorbutic for use in infant feeding, on polar expeditions, in the Navy, and in the Army.

**The antiscorbutic properties of green malt,** J. F. McClendon and W. C. C. Cole (*Amer. Jour. Physiol., 49 (1919), No. 1, pp. 145, 146*).—The authors state that by grinding green malt in a special mill, bringing the mash to 70° C. to partially destroy the oxidases, and evaporating the wort in vacuo to a sirup, a malt extract can be prepared which requires no sterilization or preservative and which retains its antiscorbutic properties. It is suggested that the use of malt extract prepared by this method might avoid the necessity of feeding orange juice to infants when oranges are difficult to obtain.

**Studies of infant feeding.—XI, High protein feeding v. high calcium absorption as to the cause of the increase in body temperature of infants.** A. W. Bosworth and H. I. Bowditch (*Amer. Jour. Diseases Children, 16 (1918), No. 5, pp. 279–292, fig. 1*).—The results of feeding experiments on healthy infants show, according to the data furnished by the authors, that the ingestion of large amounts of calcium as organic salts, if not accompanied by the ingestion of sufficient chlorin or phosphorus to permit the formation of soluble salts, will result in an accumulation of calcium in the tissues which is followed by a toxic condition and the elimination of calcium lactate in the urine. They believe that the toxic condition noticed by others when a high protein synthetic food was fed was probably the result of the high calcium content of the food, the protein being responsible only to the extent that it is the carrier of the calcium in the form of calcium caseinate. The authors are unprepared as yet to state whether this toxic condition is the result of the accumulated calcium itself or to a calcium salt, possibly calcium oxalate. The work of Binger[1] and the observations of Marriott and Howland[2] they believe furnish additional material relating to the same phenomenon.

Earlier work has been noted (E. S. R., 40, p. 661).

**The effect of alkali and malt preparations on the retention of calcium in infancy,** A. Sato (*Amer. Jour. Diseases Children, 16 (1918), No. 5, pp. 293–298*).—From the results of observations on a normal infant, the author believes that the addition of alkali to milk produces a distinctly unfavorable effect on the retention of calcium, but that the addition of malt extract without alkali acts beneficially on the calcium storage. He believes that the favorable effect of the malt is not due to the alkali originally contained in it or added to it, since malt extract which contains a considerable amount of alkali has, according to his data, an unfavorable influence on the calcium storage.

**Hospital diets and their relation to the treatment of certain diseases,** E. G. McCullough (*Canad. Med. Assoc. Jour., 6 (1916), No. 5, pp. 385–405, pl. 1, figs. 2*).—A discussion of the diet used at the Peter Brent Brigham Hospital, Boston, Mass., in the treatment of typhoid fever, nephritis, diabetes, and other ailments in which careful dietetic measures must be observed.

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[1] Jour. Pharmacol. and Expt. Ther., 10 (1917), No. 2, pp. 105–119.

[2] Arch. Int. Med., 18 (1916), No. 5, p. 708–711.

**The etiology of sprue, pellagra, and scurvy**, L. NICHOLLS (*Jour. Trop. Med. and Hyg. [London], 22 (1919), No. 3, pp. 21–24, figs. 2*).—The author compares sprue, pellagra, and scurvy on the theory that the predisposing causes of all three diseases are dietary deficiency and pathogenic organisms. The latter is thought to be the predominant factor in sprue and the former in scurvy, while in pellagra both are thought to be fairly evenly balanced. A streptococcus is considered to be the infecting agent in sprue and very probably in scurvy, but the possibility is suggested of some other class of organism being the secondary factor in pellagra. The theories advanced are discussed in detail with several references to the literature.

**The scurvy of guinea pigs, III.—The effect of age, heat, and reaction on antiscorbutic foods**, A. F. HESS and L. J. UNGER (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 293–303, pl. 1, figs. 8*).—A preliminary report of this study has been previously noted from another source (E. S. R., 41, p. 266). In addition to the investigations reported in the earlier contribution, the factor of freshness and age of the vegetables was found to affect their antiscorbutic properties on dehydration. The author points out that this variable factor renders it very difficult to prepare a table of the comparative antiscorbutic value of various foods, and that when this is attempted all the vegetables should be uniform in their development and freshness. The importance for the dehydrating industry of using only fresh young vegetables is emphasized.

**Remarks on the pathogenesis of deficiency diseases and on pellagra**, P. RONDONI (*Brit. Med. Jour., No. 3044 (1919), pp. 542–544*).—The author reports observations on "maidism," the pathological condition induced in guinea pigs by exclusive maize feeding, and compares his results and conclusions with those of McCarrison (E. S. R., 41, p. 264) on the changes in the organs of polyneuritic pigeons. The histological observations reported in the present paper are summarized as follows:

"The organs which are the most affected in guinea pigs fed on maize are the spleen, the thyroid, and the suprarenal glands. The spleen shows sclerotic lesions with increase of elastic and fibrous tissue and reduction of lymphocytes in the folliculi. The thyroid shows, in the first days of maize diet, hyperemia and often proliferation of alveolar epithelium, then hemorrhagic changes and later on sclerosis are prominent."

Certain resemblances are pointed out between the etiology and pathogenicity of maidism in guinea pigs and pellagra in man, but the author is of the opinion that maidism has certain features which differentiate it from pellagra as well as from simple starvation and scurvy.

**Dietetic helps in diabetes**, R. R. DONK (*Jour. Amer. Med. Assoc., 73 (1919), No. 1, pp. 25–27, fig. 1*).—Tables are given from which can be calculated the combinations of various foods necessary to make up any prescribed diet in the treatment of diabetes. These include values for the 5 per cent group of vegetables and the various increases (potato, bread, broth, fish, egg, fat, lean meat, etc.) calculated in protein, fat, carbohydrates, and calories.

**Analysis of normal Filipino urine**, I. CONCEPCION (*Philippine Jour. Sci., Sect. A, 13 (1918), No. 6, pp. 347–359*).—An extensive investigation is reported of the constituents of Filipino urine. The subjects consisted of Bilibid prisoners, hospital servants, laboratory helpers, and medical students. All were allowed to choose their diet except the prisoners, who were on a special ration. The urine analyses were made on the 24-hour samples collected from 3 to 7 consecutive days. The analytical results are presented in tabular form by occupational groups, and a table is also given showing the average chemical compo-

sition of Filipino urine as compared with the known standards of Europeans, Americans, and Bengalis.

The composition of Filipino urine as averaged from over 200 specimens was as follows: Daily volume 935 cc., specific gravity 1.019, total nitrogen expressed as $N_2$ 7.01 gm., urea 9.59, urea nitrogen 4.48, ammonia 0.641, ammonia nitrogen 0.534, creatinin 1.478, creatinin nitrogen 0.549, uric acid 0.376, uric acid nitrogen 0.125, undetermined nitrogen 1.271, total sulphur oxidized expressed as $SO_3$ 1.475, inorganic sulphates 1.169, ethereal sulphates 0.306, total phosphates as $P_2O_5$ 1.285, and total chlorids as NaCl 5.86 gm.

Certain points of interest are brought out by a comparison of these figures with other standards. The total quantity of urine excreted is lower than the averages found for Europeans and Americans, which is explained by the high humidity and temperature of the Philippine atmosphere. The total nitrogen represents a daily metabolism of 43.81 gm. of protein, which is only 37 per cent of Voit's standard. The figures for urea and urea nitrogen are very low. The urea nitrogen is only 63.86 per cent of the total nitrogen excreted in the urine, a result in agreement with Folin's conclusion (E. S. R., 17, p. 167) that on a reduced protein diet the proportion of urea nitrogen falls to about 60 per cent of the total nitrogen. The creatinin output, which was within the limits of the average excretion in temperate climates, is also in accord with the statement of Folin that the quantity of creatinin excreted on a low protein diet is practically the same as on a high protein diet, and of other observers that there is no evidence of a greater creatinin output in the Tropics. The low ratio of total oxidized sulphur to ethereal sulphates is explained by the vegetable character of the diet.

**Metabolism and cooling power,** L. Hill and D. Hargood-Ash (*Jour. Physiol., 52 (1919), No. 6, pp. LXIX–LXXI*).—Essentially noted from another source (E. S. R., 41, p. 365).

**Energy exchange in man,** A. Krogh (*Jour. Physiol., 52 (1919), No. 6, p. LXXIV*).—The respiratory quotient was determined by the use of a Jaquet chamber and a new gas analysis apparatus accurate both for $O_2$ and $CO_2$ to about 0.001 per cent.

The amount of technical work performed varied for the different subjects between 0.7 and 1.1 calories per minute. The metabolic energy, exclusive of resting metabolism, corresponding to 1 calorie of technical work, varied with the subjects between 5.3 and 4.2 calories and corresponding to efficiencies of between 19 and 24 per cent. A distinct influence of training upon the efficiency was observed, in one case the metabolism per calorie decreasing during 25 days from 4.6 to 4.3 calories.

The metabolism per calorie of technical work was found to be a straight line function of the respiratory quotient and distinctly higher for fat than for carbohydrate. When fat was utilized for muscular work a loss of energy took place, amounting to from 8 to 12 per cent of the fat catabolized. It is thought that this can be explained on the hypothesis that carbohydrates can be utilized more or less directly by the muscles, while fat must first be converted to some substance allied to carbohydrates. Most of the subjects found that it was easier to perform the work on a carbohydrate diet than on any other.

## ANIMAL PRODUCTION.

**[Association of Feed Control Officials.—Sixth, seventh, and eighth meetings]** (*Flour, Hay, Grain, and Feed, 26 (1914), No. 1, pp. 25–30, 32, 44, figs. 8; 28 (1915), No. 1, pp. 19–31, figs. 16; 30 (1916), No. 1, pp. 17–27, figs. 9*).—Con-

tinuing past practice (E. S. R., 28, p. 74; 30, p. 466), the proceedings of three meetings held November 13–14, 1914, November 18–19, 1915, and November 17–18, 1916, respectively, at Washington, D. C., are reported. The 1914 report includes the constitution of the association and the papers of Chapin and Duvel previously mentioned (E. S. R., 32, p. 200). The 1915 report contains discussions and committee reports on tin-plate by-products, "hominy hearts," percentage of grit in poultry feeds, ingredients present in feeding stuffs in small amounts, phosphoric acid standard for meat scrap and digester tankage, and crude fiber standards for cottonseed meal; and a paper by W. F. Ward on Feeding Beef Cattle. The 1916 proceedings include a paper by B. W. Kilgore on Peanut and Soy Bean Products for Feeding Purposes; a discussion of hominy feed; and reports on mill by-products and tin-plate middlings.

[Association of Feed Control Officials.—Ninth and tenth annual meetings] (*Feeding Stuffs, 31 (1917), No. 6, pp. 19–26, figs. 3; 34 (1919), No. 1, pp. 19, 20, 27*).—These are general accounts of the meetings held at Richmond, Va., November 23–24, 1917, and at Pittsburgh, Pa., January 13–14, 1919. The 1917 report includes a paper by G. S. Fraps on The Composition of Peanut By-products, Coconut Meal, and Soy Bean Meal.

Commercial feeding stuffs, E. G. Proulx et al. (*Indiana Sta. Bul. 228 (1919), pp. 3–170*).—This bulletin furnishes data as to the ingredients identified and the percentages of moisture, fat, and protein found in feeding stuff samples collected in 1918, and includes a general discussion of the Indiana law similar to that in previous reports (E. S. R., 40, p. 72). It is stated that reports of the 1919 inspection will be issued quarterly and will record the complete proximate analyses of the samples collected.

The materials dealt with include alfalfa meal, barley mixed feeds, malt sprouts, brewers' dried grains, buckwheat mixed feed, coconut oil meal, corn bran, corn germ meal, yellow corn germ meal, corn gluten feed, corn feed meal, hominy feed, yellow hominy feed, corn-and-oat chop, cold pressed cotton seed, cottonseed meal, cottonseed feed, cottonseed hulls, dried beet pulp, kapok seed meal, linseed meal, linseed oil meal, linseed meal and screenings, oat middlings and hulls, palm kernel oil meal, peanut oil feed, rice bran, rye middlings and screenings, velvet bean feed, wheat bran, wheat middlings, wheat mixed feed, mixed mill by-products, tin plate by-products, tankage, meat scrap, blood meal, meat-and-bone meal, and dried buttermilk, as well as a number of proprietary mixed feeds, poultry feeds, calf meals, and condimental foods.

Inspection of commercial feeds, P. H. Wessels (*Rhode Island Sta. Ann. Feed Bul., 1919, pp. 2–12*).—This is a report on the protein and fat content of 139 samples of feeding stuffs collected in 1918. The materials include alfalfa meal, barley feed, cottonseed meal, linseed meal, corn gluten feed, hominy feed, corn feed meal, distillers' and other dried grains, dried beet pulp, wheat bran, wheat bran with screenings, wheat middlings, shorts, red dog, wheat mixed feed, and various proprietary stock, calf, and poultry feeds.

The Texas feed control law.—Special advice to dealers and distributors, F. D. Fuller (*Texas Sta. Control Circ. A (1918), pp. 5–14, figs. 2*).—This publication contains the text of the Texas Feed Control Law of 1907 and directions for complying with it. The material is practically all included in Bulletin 234 (E. S. R., 40, p. 571).

Farm feeds: Grains, mill feeds, and concentrates, their nature and composition, F. T. Shutt (*Canada Expt. Farms, Bul. 36, 2. ser. (1919), pp. 48*).—Recent proximate analyses in the laboratory of the Dominion chemist of the following products are reported: Wheat bran, wheat shorts, wheat middlings, red dog (feed flour), ground barley, barley feed, ground oats, oat chop feeds, oat hulls,

corn-and-oat feeds, corn meal, hominy feed, corn bran, corn gluten feed, corn gluten meal, linseed meal (screw process), flaxseed chaff, flaxseed with bolls, flax straw shives, cottonseed meal, rice bran, rice meal, rice polish, rice shorts, distillers' dried grains, brewers' dried grains, soy beans, soy bean cake, velvet bean cake, peas and pea products, peanut meal, coconut meal, date meal, alfalfa meal, millet seed, cocoa shells, dried beet pulp, tankage, beef scrap, fish scrap, fish meal feeds, mixed chop feeds, elevator screenings, weed seeds (15 kinds), calf meals, chick feeds, and fox biscuits. The protein and oil content of flaxseed and additional samples of linseed meal, and the sugar content of several molasses feeds are also included. Average analyses of some of these materials from American and Canadian sources are presented for comparison, and in many cases the methods of manufacture are indicated. An abridgement of the paper noted below is included.

**The composition of bran and shorts as milled under the regulations of the Canada Food Board**, F. T. Shutt and R. L. Dorrance (*Agr. Gaz. Canada, 5 (1918), No. 8, pp. 760–762*).—Canadian samples of bran and shorts collected in 1903 and 1917 are compared as to proximate composition with samples collected after April 1, 1918, when regulations became effective in Canada requiring a 76 instead of the customary 72.5 per cent extraction of spring wheat by millers.

The 1918 bran showed a lower moisture content and increases of about 0.75 in the protein percentage, 0.5 in the fat, and 1.5 in the fiber. The shorts showed decreased moisture, increases of about 1.75 in protein and 2.5 in fiber percentage, and a decrease in nitrogen-free extract. The 1918 samples were much more uniform in protein, fat, and fiber content than the earlier collections.

**Range management on the National Forests**, J. T. Jardine and M. Anderson (*U. S. Dept. Agr. Bul. 790 (1919), pp. 98, pls. 32, figs. 4*).—The object of this publication is to aid in bringing about uniformity in range management and a better understanding of grazing use in relation to the other uses of the National Forests. The topics covered include the determination of the class of stock to which a range is best suited, grazing periods, grazing capacity, management of cattle on the range, management of sheep on the range, range reseeding, grazing in relation to protection of timber, watersheds, game, and recreational use, and range reconnaissance and inspection. A special bibliography for each of these topics is added. There are also brief sections on stock driveways and poisonous plants, a bibliography for stock-poisoning plants in the United States, and notes on the collection and identification of forage and range plants.

**Fattening steers on summer pasture in the South**, W. F. Ward, D. T. Gray, and E. R. Lloyd (*U. S. Dept. Agr. Bul. 777 (1919), pp. 24, fig. 1*).—Steer feeding experiments during the summers of 1912 and 1913 in collaboration with the Alabama College Experiment Station, and during the summers of 1915 and 1916 in collaboration with the Mississippi Experiment Station, are reported. They form part of a general cooperative series (E. S. R., 40, p. 873) and follow the pasture experiments reported in part 2 of Bulletin 110 (E. S. R., 31, p. 664).

The experiments were designed to compare summer pasture alone with pasture plus cottonseed cake. In two of the years a lot was also fed in which half the cake was replaced by corn. The principal pasture grasses were lespedeza, Bermuda grass, and crab grass. The Alabama pastures were seeded with sweet clover, and the 1916 pasture contained abundant white clover. During 1912, 2- and 3-year-old grades of beef breeds of fair quality were fed. In each successive season poorer and more mature cattle seem to have been

used. Jersey blood apparently predominated among the Mississippi steers. Other details and the principal results are given in the following table:

*Steer feeding on southern pastures, with and without supplement.*

| Year. | Lot. | Supplements per day. | | Number of steers. | Duration of test. | Average initial weight per head. | Average gain per head. | | Feed charge per pound of gain. | Selling price per cwt. | Average dressing per centage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cottonseed cake. | Corn. | | | | Per day. | Total. | | | |
| | | *Lbs.* | *Lbs.* | | *Days.* | *Lbs.* | *Lbs.* | *Lbs.* | *Cents.* | | |
| 1912 | 1 | ..... | ..... | 29 | 112 | 646 | 1.04 | 117 | 1.7 | $4.00 | 48.7 |
| | 2 | 1.75 | [1] 1.75 | 25 | 106 | 601 | 1.35 | 143 | 5.1 | 4.75 | 51.9 |
| | 3 | 3.56 | ..... | 36 | 101 | 611 | 1.28 | 129 | 5.3 | 4.75 | 51.6 |
| 1913 | 1 | ..... | ..... | 26 | 147 | 610 | 1.63 | 240 | 1.1 | 5.00 | ..... |
| | 2 | 1.79 | [2] 1.76 | 25 | 147 | 588 | 1.71 | 252 | 3.5 | 6.00 | ..... |
| | 3 | 3.70 | ..... | 26 | 147 | 593 | 2.10 | 309 | 3.3 | 6.00 | ..... |
| 1915 | 1 | ..... | ..... | 20 | 107 | 678 | 1.68 | 180 | 1.1 | 5.75 | ..... |
| | 2 | 3.65 | ..... | 20 | 107 | 678 | 2.00 | 214 | 3.4 | 6.35 | 50.8 |
| 1916 | 1 | ..... | ..... | 30 | 134 | 662 | 1.60 | 214 | 1.1 | 5.85 | 51.2 |
| | 2 | 4.32 | ..... | 30 | 134 | 664 | 1.92 | 257 | 4.5 | 6.10 | 54.2 |

[1] Corn chop. [2] Corn-and-cob meal.

A pasture charge of 50 cts. per head for each 28 days was assigned in all the experiments. The price of cottonseed cake in the successive years was $28, $27.50, $29.60, and $32 per ton, respectively. The charge for corn in 1912 was 85.5 cts. a bushel and in 1913, 70 cts.

The cake-fed steers showed throughout distinctly better finish than the others. This difference is reflected in the comparative selling prices of any one year and in the dressing percentages. The grass-fed steers of 1915 had to be sold as stockers. In spite of the higher cost, cake feeding returned more profit each year than pasture without supplement, except in 1916, when lot 2 was fed at a loss of 5 cents per head. The profits in different years are not comparable, since charges for freight, commission, yardage, etc., were added to the costs in 1915 and 1916, but not in 1912 and 1913. The poor showing of the 1916 cake-fed steers is attributed in part to inferior breeding.

The partial replacement of cake by corn chop or corn-and-cob meal is not considered desirable under the conditions of the experiments reported unless very cheap corn is available.

The use of cottonseed cake as a pasture supplement is recommended because of the higher prices the steers will generally bring, the added fertilizing value of the manure, and the earlier date at which the animals can be marketed.

**Cattle feeding experiments**, J. M. Scott (*Florida Sta. Rpt. 1918, pp. 18–20*).—Two cooperative experiments on private farms in collaboration with the Bureau of Animal Industry of the U. S. Department of Agriculture are reported.

In the first, 220 native steers 3 to 5 years old, averaging 582 lbs. in weight per head, were turned into an 80-acre Florida velvet bean field November 5, 1917. After 28 days the animals averaged 590 lbs. and the feed was changed to sorghum silage, velvet beans in pod, and cottonseed meal. On the fifty-sixth day the weight was 589 lbs., and on the eighty-fourth, when the experiment terminated, 644 lbs. The average daily gain per head was 0.74 lb. There was a $2 margin and a profit of $4.02 per head.

In the other experiment 116 native steers similar to the preceding were pastured on an 85-acre field of velvet beans for 72 days, beginning November 6, 1917. They lost considerably in weight for a while in December, but there was an average daily gain for the whole period of 0.267 lb. per steer. The

pasture charge was $9 an acre and the profit $6.35 per head, with the same margin as before.

**Corn silage for beef production**, J. W. WILSON and B. L. THOMPSON (*South Dakota Sta. Bul. 182 (1918), pp. 3–12, figs. 5*).—Tests during two winters with silage made from corn cut at different stages of maturity are reported. Four lots of 5 steers were fed each season, yearling Aberdeen Angus grades being used in 1917 and 2-year-old Hereford grades in 1918. Silage was the only feed given. The main results follow:

*Results of feeding steers with silage made from corn cut at different growth stages.*

| Stage at which corn was cut. | Year. | Feeding period. | Initial weight per head. | Daily gain per head. | Daily silage consumption per head. | Silage consumed per pound of gain. | Dry substance consumed per pound of gain. |
|---|---|---|---|---|---|---|---|
| | | *Days.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* |
| Mature (frosted) | 1917 | 119 | 709 | 2.18 | 54.5 | 24.9 | 10.9 |
| Do | 1918 | 90 | 945 | 2.00 | 57.8 | 28.8 | 10.5 |
| Glazed stage | 1917 | 119 | 765 | 1.94 | 62.4 | 31.9 | 8.0 |
| Do | 1918 | 90 | 943 | 2.61 | 80.9 | 30.9 | 8.1 |
| Dough stage | 1917 | 119 | 737 | 2.01 | 64.4 | 31.9 | 8.4 |
| Do | 1918 | 90 | 947 | 2.54 | 82.4 | 32.3 | 8.9 |
| Milk stage | 1917 | 119 | 733 | 2.01 | 72.8 | 36.1 | 7.5 |
| Do | 1918 | 90 | 945 | 1.86 | 81.1 | 43.6 | 9.1 |

It is concluded that silage made from corn cut when the kernels were glazed produced the most satisfactory gains. Proximate analyses of the eight different silages are tabulated.

**[Steer feeding experiments in Canada]** (*Canada Expt. Farms Rpt. 1918, pp. 67, 68, 111*).—A continuation of tests at the Kentville, N. S., Experimental Station (E. S. R., 40, p. 768) is reported by W. S. Blair (pp. 67, 68). Two lots of 12 steers each were fed from November 28, 1917, to March 31, 1918. One lot, fed 35 lbs. of corn silage daily, gained at the rate of 1.7 lbs. per head per day. The other, fed 45 lbs. of turnips, made a corresponding gain of 1.8 lbs. There was a hay ration of 12 lbs. and a grain ration when in full feed of 5 lbs. of a mixture of bran, cottonseed, and linseed meal.

Two tests at the Brandon, Man., Experimental Farm are reported by W. C. McKillican (p. 111). A lot of 11 steers made a gain of 140.6 lbs. per head on silage, hay, and grain, at a cost of 13.4 cts. per pound of gain. A comparable lot in the same (undesignated) period made average gains of 143.7 lbs. each at a cost of 15 cts. per pound. In the second experiment, a group of high-grade steers gained 239.1 lbs. per head, while a group of ordinary stockers gained 216.1 lbs. The cost per pound of gain was lower and the labor income and profit per steer higher in the case of the grades. The labor income and profit per $100 invested in steers and feed was higher in the case of the stockers.

**Raising calves on farms where whole milk is sold**, W. W. SWETT (*Missouri Sta. Circ. 88 (1919), pp. 13, fig. 1*).—Where no skim milk is produced, the use of calf meal gruel after a short period of whole milk feeding is recommended as a makeshift. Methods of preparing gruel and feeding it are outlined. If, however, there is even a limited amount of skim milk available due to the separation of surplus whole milk, the problem, it is pointed out, is considerably simplified. After two or three weeks skim milk can be substituted for whole milk, and no calf meal need be used.

Preliminary report is made of experiments by M. H. Fohrman with Holstein and Jersey calves as to the necessary duration of skim milk feeding under these circumstances. It is claimed that practically normal growth occurred when the calves were fed liberally on skim milk, legume hay, and grain for only 60 days and then changed to a straight hay and grain ration.

**Sheep on irrigated farms in the Northwest**, S. O. JAYNE (*U. S. Dept. Agr., Farmers' Bul. 1051 (1919), pp. 32, figs. 6*).—About half this publication deals with the general problems of sheep management on irrigated farms with special reference to feeds and pasture, and summarizes the economic position of sheep husbandry in irrigation agriculture. The rest consists of reports of a survey made by the Office of Farm Management of 12 representative sheep farms in the irrigated districts of Washington, Idaho, and Montana. The reports outline the system of flock management on each farm and give notes on other live stock raised, crops grown, pastures used, prices received for wool, etc.

These farms "illustrate some of the varied conditions under which sheep are being kept to good advantage on irrigated farms, and show that the business is one that need not be confined to farms of any particular size or type or locality. . . . There are not many irrigated farms anywhere in the Northwest on which small flocks of sheep could not be kept with profit, if given proper care."

**Does it pay to feed corn to fattening lambs on pasture?** J. W. HAMMOND (*Mo. Bul. Ohio Sta., 4 (1919), No. 7, pp. 228–231*).—Two sets of experiments are reported, one at the Southeastern Test Farm at Carpenter, the other at Wooster. The former consisted of tests during the summers of 1916 and 1917 in which a lot of lambs on blue grass pasture and another lot on a succession of forage crops (rye, red clover, and rape) were given a full feed of corn. Southdown×Merino lambs were used the first season and Merinos the second. The lambs used in experiments 2 and 3, respectively, of a previous report (E. S. R., 41, p. 177) constituted the check lots of the successive years. The feeding of corn increased the gain on blue grass 11.5 per cent in 1916 and 35.5 per cent in 1917, and on forage crops 12.6 and 21.1 per cent, respectively; increased the average dressing percentage in each case; and increased the market value per hundred pounds.

The experiments at Wooster were made in 1917 with 52-lb. grade Shropshire and with 46-lb. Shropshire×Merino lambs on rape pasture. A lot of each was given a full feed of corn, another a half feed, and a third no supplement. The daily gains on rape alone averaged 0.28 lb. per head for the grades and 0.33 lb. for the crossbreds. The corresponding gains on corn, half feed, were 0.37 and 0.34 lb., and on corn, full feed, 0.4 and 0.35 lb. There were practically no differences in the finish of the several lots nor in the average dressing percentages.

For each set of experiments computations are presented showing the profits or loss attending the feeding of corn of different prices to fattening lambs on pasture. It is concluded with some reservations that the operation would be profitable with corn at $1.12 a bushel but not at higher prices unless good pasture were scarce.

**Feeding experiments [with hogs]**, J. M. SCOTT (*Florida Sta. Rpt. 1918, pp. 21–23*).—Three lots of 5 hogs each weighing about 90 to 95 lbs. per head were put on a 62-day feeding trial beginning December 4, 1917. The respective lots were fed shelled corn alone, shelled corn and unhulled peanut oil feed (6.5:1), and shelled corn and velvet bean feed (5:1), with corresponding daily gains of 0.8, 0.61, and 0.58 lb. per head. Each lot also received 10 lbs. of green rape daily. All of the carcasses were hard after 48 hours in the cooler, and the peanut-fed lot was indistinguishable from the others.

In a later experiment, begun March 7 and continued for 97 days, 6 hogs receiving unhulled peanut oil meal in varied but higher proportions with corn (1:5, 1:4, and 1:3) produced carcasses which did not harden, although the pork was of good quality and was not oily. Two hogs fed on corn as a check made the lowest gains (0.2 lb. per head per day) while the animals receiving the greatest amount of peanut meal made the best gains (0.7 lb.). It is also noted that 3 hogs fed shelled corn and cooked velvet bean feed (3:1 at start, 2:1 later) made an average daily gain of 0.49 lb. per day during the 85 days of the test.

**Economical substitutes in swine feeding,** G. B. ROTHWELL (*Agr. Gaz. Canada, 5 (1918), No. 5, pp. 440–446, figs. 2*).—Possible substitutes for the different feeds—corn, barley, wheat by-products, and oats—commonly fed hogs in Canada are discussed on the basis of experiments at the various Dominion experimental farms. Cottonseed meal, gluten feed, linseed meal, buckwheat screenings, tankage, skim milk, whey, and buttermilk are briefly considered. The economy of pasture crops and self-feeders is noted.

Special mention is made of two recent experiments. At Lacombe, Alta., hogs on rape pasture in 1917 consumed 4.34 lbs. of grain per pound of gain when self-fed, and 4.72 lbs. when hand fed. An acre of rape had a carrying capacity of 9,254 lbs. for 146 days when the hogs were self-fed on grain. The self-feeding, it is estimated, saved 2,453 lbs. of grain per acre. At Ottawa in 1917 a lot of pigs fed meal and tankage in a self-feeder gained at the daily rate of 0.53 lb. per head for 66 days, while a similar lot self-fed with meal and skim milk averaged 1.05 lbs. gain during the same number of days. Another lot also receiving meal and skim milk but trough-fed is contrasted with the latter. During 88 days the average daily gain per head was 0.85 lb.

**[Swine feeding experiments in Canada]** (*Canada Expt. Farms Rpt. 1918, pp. 112, 129*).—Experiments at the Brandon, Man., Experimental Farm are reported by W. C. McKillican (p. 112). A lot of 10 pigs fed crushed barley and red dog flour made a total gain of 294 lbs. at a cost of 10.4 cts. per pound. A similar lot given crushed barley and boiled pigweed seed gained 175 lbs. at a cost of 14 cts. per pound. A third lot of 10 receiving all three feeds gained 268 lbs. at a cost of 12.5 cts. per pound.

Five lots of 100-lb. hogs were fed to determine the value of grade A screenings as a winter feed. The gains from a lot receiving screenings alone cost 10.1 cts. per pound. Gains from crushed barley alone cost 20 cts., from red dog and screenings (1:1) 18.7 cts., from shorts and screenings (1:1) 13.8 cts., and from shorts and barley (1:1) 15.4 cts. It is also noted that the gains of 20 pigs on pasture cost 6.2 cts. per pound, while 20 similar pigs in dry lot gained at a cost of 7 cts. per pound. No other details of these experiments are given.

Brief report of the Lacombe, Alta., experiments noted above is made by G. H. Hutton (p. 129). It appears that a lot of pigs self-fed without pasture was also included in the tests. These animals consumed 6.16 lbs. of grain per pound of gain.

**Hogging down rye,** W. L. ROBISON (*Mo. Bul. Ohio Sta., 4 (1919), No. 6, pp. 179–181*).—Experiments at the Miami County experiment farm during the years 1914–1916 are reviewed to show that the practice of hogging down rye, in spite of prior arguments in favor of it, results in slow and expensive gains, as the hogs eat little more than a maintenance ration. Details of the tests have been noted from the annual reports of the county experiment farms (E. S. R., 33, p. 871; 36, p. 869; 39, p. 778).

**Citrus fruit rinds as a hog feed,** R. S. ALLEN (*Maryland Sta. Bul. 227 (1919), pp. 193–202*).—When it is recommended on sanitary grounds that garbage destined for hog feeding be cooked, the author has encountered a belief that cooked citrus fruit rinds are poisonous to hogs. To test this, an experiment with 4 lots of 3 hogs was instituted at the request of the National Research Council. All lots received corn meal, linseed meal, and tankage (94:3:3). One lot was given no additional feed, and the others received liberal allowances of cooked orange rind, cooked lemon rind, and cooked grapefruit rind, respectively. The rinds constituted about a third of the feed consumed. The grapefruit lot was discontinued after 40 days owing to shortage of material. The others were fed 89 days. The weights of the individual pigs every 10 days are tabulated. No toxic influence was detected. The orange and lemon fed lots consumed, respectively, 6.7 and 5.7 lbs. of feed per pound of gain, while the check lot required 10.5 lbs.

[**Feed records of Canadian horses**] (*Canada Expt. Farms Rpt. 1918, pp. 84, 85, 90, 91*).—The amounts of feed consumed by 2 foals and their dams at the experiment station, Ste. Anne de la Pocatiere, Que., are reported by J. Begin (pp. 84, 85). A Percheron mare with a 45-day colt was purchased. During 5 months of nursing the mare consumed 1,888 lbs. of grain and chop and 1,975 lbs. of hay, and was on pasture 2.5 months. The feed consumed by the colt during the first 7 months after weaning consisted of 579 lbs. oats, 624 lbs. bran, 309 lbs. chop, 2,234 lbs. hay, 75 lbs. whole milk, and 676 lbs. roots. The mare weighed 1,750 lbs. and the colt at 3 months, 590 lbs., and at 12 months, 1,175 lbs.

The dam of a Percheron filly born April 11, 1917, consumed during the nursing period (up to November 1) 901 lbs. oats, 683 lbs. bran, 100 lbs. chop, and 2,384 lbs. hay, and was on pasture 4.5 months. During the 5 months after weaning the filly ate 478 lbs. oats, 448 lbs. bran, 152 lbs. chop, 71 lbs. whole milk, and 497 lbs. roots. The mare weighed 1,775 lbs. and the colt at 3 months 540 lbs., and at 12 months, 1,125 lbs.

Feeding records of horses at the Cap Rouge, Que., Experimental Station are reported by G. A. Langelier (pp. 90, 91). All feed given to a colt and two fillies was weighed until they were broken and put to work at an average age of 34 months, 7 days. The quantities consumed per head were 13,063 lbs. hay, 4,278 lbs. oats, 4,830 lbs. bran, 29 lbs. wheat, 5 lbs. linseed meal, 1,036 lbs. skim milk, 29 lbs. whole milk, and a "very little pasture." Similar records of 2 working mares for a year are also averaged, the quantities being 4,440 lbs. hay, 4,770 lbs. oats, 972 lbs. bran, and 132 lbs. common molasses per head. The average number of hours of work was 1,639.

**Feeding experiments with Leghorns,** A. G. PHILIPS (*Indiana Sta. Bul. 227 (1919), pp. 3–28, figs. 7*).—Feeding experiments with White Leghorn pullets during the years 1914–15 to 1917–18, in continuation of those previously noted (E. S. R., 34, p. 376), and studies of the influence of confinement on egg production made in 1913–14 with hens and in 1914–15 with pullets are reported. The grain and mash rations and general treatment were the same as in the contemporaneous Plymouth Rock experiments (E. S. R., 40, p. 76). Three pens of 30 birds each were used in each of the six experiments.

The first two feeding experiments were duplicates. One pen received 5.3 lbs. of cottonseed meal mixed with the mash, another had 50 lbs. of buttermilk to drink for each 35 lbs. of standard grain and mash, while the third received 50 lbs. of buttermilk and a double allowance of grain, making the ratio of grain to mash 5:1.

The other two feeding experiments also duplicated each other. One pen was fed only the standard grain and mash, while the second and third received

3.5 lbs. of meat scraps and 3 lbs. of tankage, respectively, in addition. It was estimated that equal amounts of animal protein would be furnished the latter pens. The main results of the feeding experiments are summarized in the following table:

*Annual egg and feed records per bird of Leghorn pullets during feeding experiments.*

| Averages of first and second experiments. | | | | Averages of third and fourth experiments. | | | |
|---|---|---|---|---|---|---|---|
| Additions to standard ration. | Number of eggs. | Grain and mash consumed. | Total feed per pound of eggs. | Additions to standard ration. | Number of eggs. | Grain and mash consumed. | Total feed per pound of eggs. |
| | | *Lbs.* | *Lbs.* | | | *Lbs.* | *Lbs.* |
| Cottonseed meal | 55.7 | 50.2 | 9.05 | Meat scrap | 179.1 | 70.5 | 3.77 |
| Buttermilk | 166.9 | 63.1 | [1] 7.77 | Tankage | 183.5 | 71.3 | 3.60 |
| Buttermilk and grain | 137.9 | 64.2 | [1] 7.23 | None | 59.5 | 62.0 | 9.32 |

[1] Liquid buttermilk computed at 10 per cent of its weight.

Cottonseed meal is considered practically worthless as a protein concentrate for egg production. The egg records of the birds receiving it were especially low during the winter.

In the experiments on the influence of confinement it was found that birds kept housed continuously averaged 112.3 eggs per year, those with access to a small yard (10 by 80 ft.) 124.4 eggs, and those with access to a free range (130 by 160 ft.), 128.75 eggs.

**Poultry feeding experiments**, R. B. THOMPSON (*New Mexico Sta. Bul. 117 (1918), pp. 22, figs. 5*).—This bulletin presents in tabular form the production and feed records from January 15 to June 15, 1918, of each of 15 pens of varied size (9 to 33 birds) for each of 5 periods of varied length (28 to 32 days). A group of 5 pens, totaling 11 Rhode Island Red pullets, 29 White Leghorn pullets, and 57 White Leghorn hens, received a mash of bran, ground oats, and meat scrap (2:1:2). Three other groups each received a mash which was a variant of this. Ground milo maize replaced the oats in the mash given to 4 pens comprising 16 White Wyandotte pullets and 84 White Leghorn pullets. Alfalfa meal replaced bran in the rations of 2 pens that included 22 first year and 33 second year White Leghorns. Finally, 3 parts of cottonseed meal was given in place of the meat scrap to the remaining birds, 20 Rhode Island Red pullets and 24 White Leghorn hens. The scratch in all cases consisted of whole oats and milo maize. When the birds did not have access to growing alfalfa they were given green rape and beets.

The records are not summarized so as to compare the different mashes, but all four are considered satisfactory. The hens, but not the pullets of the last group produced eggs showing "cottonseed meals spots."

The experiment was planned at the time of a wheat shortage. It is suggested that whenever a common ingredient of poultry feeds is not available a simple combination of accessible feeds should be tried and not the complex mixtures often sold by manufacturers.

**The influence of age of hens on egg production**, H. E. DVORACHEK and S. R. STOUT (*Arkansas Sta. Bul. 163 (1919), pp. 3–8*).—The annual egg records of individual hens in their pullet and subsequent years are tabulated. There were two pens of Single Comb White Leghorns and a pen each of Anconas, Single Comb Black Minorcas, Barred Plymouth Rocks, Columbian Plymouth

Rocks, White Orpingtons, and Buff Orpingtons. The Ancona pen started with 6 birds, the others with 12. The number of birds was reduced from 90 to 87 in the second year and to 67 in the third. The average egg production of the pullet year was 72.17 eggs per hen, of the second year 61.48 eggs, and of the third year 50.53. Fourteen Plymouth Rocks were retained for a fourth year and produced 24.57 eggs per hen. The birds of the Mediterranean class laid more consistently throughout the first three years than did the Plymouth Rocks or the Orpingtons.

The percentage production of each pen by months is also tabulated. The older birds showed a greater decrease in winter than in summer production.

**Artificial illumination of poultry houses to increase fall and winter egg production**, V. G. AUBRY (*New Jersey Stas. Hints to Poultrymen, 7 (1919), No. 10, pp. 4*).—The management of laying hens when winter days are artificially prolonged by the use of electric lights or other sources of illumination is briefly outlined. It is pointed out that no mystery attaches to this much discussed method of increasing egg production; the birds merely have more time to eat.

**How to prevent loss in market eggs**, G. H. POUND (*New Jersey Stas. Hints to Poultrymen, 7 (1919), No. 9, pp. 4*).—Notes on the grading, handling, and packing of market eggs are given. It is stated that poultrymen in Petaluma, Cal., because of the attention they give to these matters, are able to undersell New Jersey poultrymen in the wholesale fancy egg market of New York City.

## DAIRY FARMING—DAIRYING.

**Experimental feeding [of dairy stock]**, G. A. LANGELIER (*Canada Expt. Farms Rpt 1918, pp. 88, 89*).—Experiments conducted at Cap Rouge, Que., are reported.

A group of 3 calves reared mostly on skim milk and a home-made calf meal composed of corn, oats, and flaxseed (4:2:1), consumed in the first 24 weeks after birth 89.5 lbs. of whole milk, 2,322 lbs. skim milk, 266 lbs. of the meal, 220 lbs. of hay, 103 lbs. of roots, and 15 lbs. of silage per head.

Continuing work previously noted (E. S. R., 40, p. 775) the average feed consumed by a heifer until calving time (about 28 months) was found to be 892 lbs. whole milk, 7,553 lbs. skim milk, 764 lbs. meal, 2,910 lbs. hay, 5,590 lbs. roots, 6,074 lbs. silage, 181 lbs. green feed, and 94 days of pasture.

A group of milch cows allowed an unlimited grain ration consumed a pound of meal for each 2.18 lbs. of milk produced. The profits (on a 1913 price basis) were greater than those from two other groups receiving a pound of meal, respectively, for each 4 and for each 8 lbs. of milk.

There is also a note on the growth of two heifers, twin sisters, one fed a heavy ration, one a light one.

**Report on calf-feeding experiments conducted at the college farm, Kilmarnock, in 1916 and 1917**, W. G. R. PATERSON (*West of Scot. Agr. Col. Bul. 84 (1918), pp. 13–23*).—To study economical methods of rearing calves in cheese making districts, 32 Ayrshire calves were fed during the course of the two years' experiments. It was found that the gradual replacement of whole milk by whey between the third and sixth week and then the feeding of whey with grain or other concentrates resulted in calves practically as thrifty and as well-grown as the check lots fed skim milk and crushed oats. The concentrates fed with the whey included (1) oat meal and fish meal, (2) palm-nut meal, and (3) fine middlings and fish meal.

**The escutcheons of dairy cows**, J. J. HOOPER (*Breeder's Gaz., 76 (1919), No. 2, pp. 52, 53*).—A brief discussion is given of the escutcheons of 1,019 dairy

cows examined by the author and J. W. Whitehouse, working at the Kentucky Experiment Station. It was found that Guenon's Flandrine type predominated among Holstein, Guernsey, Kerry, and the few Ayrshire cows examined, while the Selvedges type was most common among Jerseys. Average production records of Jerseys are cited, the types of cows with lower order escutcheons of both the Flandrine and the Selvedges type yielding more milk and butterfat than those with first order escutcheons of corresponding type.

**Composite samples, their value to the dairy plant,** T. MOJONNIER (*Creamery and Milk Plant Mo., 7 (1918), No. 12, pp. 32d, 32e*).—The use of formaldehyde to preserve composite samples of milk is advocated. Data from 16 samples thus preserved are tabulated to show that no significant changes occurred in the percentages of fat and total solids during 31 days.

**Varying bacteriological results obtained by different laboratories,** C. H. KILBOURNE (*Creamery and Milk Plant Mo., 7 (1918), Nos. 10, pp. 54–56; 11, pp. 40–42, 44*).—The author records his efforts to secure greater uniformity in the results of different commercial laboratories in the bacteriological examination of the same samples of milk. Bacterial counts of a number of subsamples distributed to four laboratories are tabulated and the variations in technique noted. A satisfactory degree of uniformity was secured only when analysts from each concern worked together in the same laboratory and made conscious effort to follow the same procedure.

**A new method for scoring dairies,** H. F. JUDKINS (*Creamery and Milk Plant Mo., 7 (1918), No. 7, pp. 27–29*).—The characteristic features of the proposed system of scoring is that the inspector fills out the answers (usually with "yes" or "no") to a questionnaire as to conditions on each dairy farm visited, and that from these answers a rating is given not to each item of equipment or method but to four groups of items. The groups are: (1) Primary equipment, including health of cows, sanitary conditions of the barns, type of milk pail, and provisions for cooling milk and washing the utensils; (2) secondary equipment; (3) primary methods, including procedure at milking, disposal of manure, washing of utensils, and care of milk; and (4) secondary methods. The scores allowed each group are respectively, 30, 5, 55, and 10 points.

The principal advantage claimed is the latitude allowed the inspector in being able to vary the relative weights of the individual items to meet local conditions or to conform to advances in dairy science. It is also held that the answers to the questions would provide more useful information to the main office than a mere numerical rating.

**The Chicago milk inquiry,** C. S. DUNCAN (*Jour. Polit. Econ., 26 (1918), No. 4, pp. 321–346*).—This paper presents a statement of events leading to the formation in December, 1917, of a commission to fix a fair price for milk in the Chicago district; summarizes the briefs presented by the producers, by the distributors, and by the City Club of Chicago which represented the consumers; outlines some of the testimony reported in the (apparently unpublished) record of the commission; analyzes the issues at stake; and discusses the decision which the commission rendered in February, 1918, and the controversies resulting.

The commission was occupied mostly in considering cost of production. Twelve formulas to determine the amounts of feed and labor required to produce 100 lbs. of milk are tabulated by the author from among those collected by the City Club from various sources. In discussing how these were to be converted into money values, the farmers held that the farm values of home-grown feeds should be used while the consumers would allow only the actual cost of growing and preparing the feeds. The commission in its majority report avoided a decision on this point by assuming that the producers' prices

for the years 1908 to 1915 were fair under the conditions then operating, and recommended that the new price be the average price of this period plus a percentage increase equal to the relative increase in the cost of feed and labor.

**Report of Chicago Milk Commission** (*Creamery and Milk Plant Mo., 7 (1918), No. 3, pp. 17–22*).—The text of the majority report of the commission referred to above is printed, together with a minority report by W. J. Kittle, and statements by E. Davenport and P. G. Holden, two members who refused to vote in favor of the majority report.

## VETERINARY MEDICINE.

**The influence of deficient nutrition on the production of agglutinins, complement, and amboceptor,** S. S. Zilva (*Biochem. Jour., 13 (1919), No. 2, pp. 172–194, figs. 8*).—The author suggests the urgency of a systematic study of the influence of nutrition on the production of immunity, and contributes to this study the report of an investigation of the effect of deficient diets on amboceptor and agglutinin formation and complement content. The influence of the following dietetic deficiencies was studied; (1) diets low in iron, calcium, potassium, sodium, chlorin, and phosphorus, respectively; (2) diets containing 12 per cent and 8 per cent of caseinogen as a source of protein; (3) diets containing 18 per cent of gliadin as the sole source of protein; and (4) diets deficient in each of the three accessory food factors. The influence of the quantitatively restricted diet on the complement content was also studied. Rats were employed for the investigation of the action of deficient proteins, restricted mineral salts, and accessory food factors on the production of amboceptor and agglutinins, and guinea pigs for the study of the influence of quantitatively restricted diets on the complement content of the blood and the influence of a diet restricted in antiscorbutic factor on the production of amboceptor and agglutinins. The technique employed and experimental data obtained are described in detail and illustrated by tables and charts.

"Although several of the deficiencies became manifest by the restricted growth and the poor condition of the animals, no differentiation in the titers of the agglutinins and amboceptor could be recorded, except in the group receiving the diet low in phosphorus. Guinea pigs fed on an unrestricted mixed diet, quantitatively restricted mixed diet, and a scorbutic diet, showed no differentiation in the amboceptor and agglutinin titers, or in the complement activity of the blood."

The author states in conclusion that the results of the experiments can at present be considered only an indication, and that further investigation is necessary in order to establish the fact definitely that a diet low in phosphorus is the only one showing a well marked differentiation in the production of agglutinins and amboceptor.

**Growth accessory substances for pathogenic bacteria in animal tissues,** I. J. Kligler (*Jour. Expt. Med., 30 (1919), No. 1, pp. 31–44*).—The object of the investigation reported was to determine (1) the effect of vitamins on the growth of a number of organisms pathogenic for man, (2) the distribution of these substances in animal tissues, and (3) the relative significance of the fat-soluble A and water-soluble B factors in the cultivation of these microorganisms.

The organisms studied included the meningococcus, pneumococcus, streptococcus, *Bacillus diphtheriæ*, *B. pertussis*, and *B. influenzæ*, and in the course of the investigation beef heart, goat blood, rabbit and cat tissues, and human secretions (nasal secretion and saliva) were used. Extracts of the tissues with saline solution were added in graded amounts to nutrient broth or agar,

or to phosphate peptone agar, which was then inoculated with small amounts of culture suspensions. The tubes were incubated at 37° C. and observations made daily for several days.

"The growth of all pathogenic bacteria studied was favorably influenced by the addition of small amounts of tissue extracts. Beef heart, rabbit and cat tissues, and human nasal secretions contain substances favorable to the growth of the organisms tested. The mucosa of different organs, spleen, liver, and kidney, are relatively rich in these substances, while muscle is relatively poor. The favorable effect of the extracts is manifested by an enhancement of growth and a reduction of lag."

Evidence is furnished indicating that the favorable effect upon bacterial development is produced by the water-soluble vitamins present in the tissue employed.

**Studies on the biology of streptococcus.—I. Antigenic relationships between strains of Streptococcus hemolyticus.** A. R. Dochez, O. T. Avery, and R. C. Lancefield (*Jour. Expt. Med., 30 (1919), No. 3, pp. 179–213*).—The problem of the complete biological classification of pathogenic organisms is considered by the authors to consist of (1) the development of reliable methods for the determination of antigenic differences between members of the species and the application of these methods to the discovery of the immunological relationships between a limited number of strains, (2) the application of this tentative classification to a large number of strains of the organism obtained under normal conditions of pathogenicity, and (3) a comparison by the same methods of the pathogenic with the saprophytic varieties of the organism.

This paper presents a partial study of *S. hemolyticus* in accordance with the plan outlined above. A technique was developed for studying the immunological reactions of agglutination and protection in 125 human strains of hemolytic streptococci obtained from various sources. By the reaction of agglutination four distinct immunological types, two types at present not completely investigated, and a certain number of unclassifiable strains were descovered. It was found possible to raise the animal virulence of a certain number of strains to a high degree and to produce antistreptococcic sera of sufficiently high titer for reliable protection tests. In all instances in which this was done the protection reaction has corroborated the evidence obtained from the agglutination test.

These results indicate that *S. hemolyticus* of human origin is not a unit type, as was previously supposed, but probably consists of a number of types, at least four of which have been definitely identified. No evidence was obtained to support the contention that freshly isolated human strains change their antigenic properties on animal passage, and that this procedure for the development of animal virulence gives a common antigenic character to all strains. On the contrary, the antigenic differences between strains of *S. hemloyticus* which had been passed through animals were as distinct as those between strains which had not been so passed.

It is emphasized in conclusion that only a beginning has been made in the classification of *S. hemolyticus*, and that much work must be done before the classification is complete and the relative dominance of the different pathogenic varieties determined.

**The antigenic properties of proteoses.** E. B. Fink (*Jour. Infect. Diseases, 25 (1919), No. 2, pp. 97–123*).—This paper consists of a summary of the literature on attempts to demonstrate the formation of antibodies against incomplete protein molecules, and a report of an investigation of the antigenic properties of proteoses from Witte peptone and from egg white.

The cold-alcohol-soluble, hot-alcohol-soluble, and alcohol-insoluble fractions of Witte peptone were unable to stimulate the production of precipitins or complement binding antibodies when injected into rabbits. Anaphylaxis experiments with guinea pigs showed that these preparations had only slight power of sensitizing to themselves, were not able to sensitize to beef serum, and did not produce symptoms of anaphylactic intoxication in animals sensitized to beef serum. Beef serum did not sensitize to products of Witte peptone nor produce shock in animals sensitized to such products.

The proteose preparations from egg white were obtained by hydrolysis of the coagulated material, and fractional precipitation with ammonium sulphate. Experiments with rabbits indicated that the 1/4, 1/3, 1/2, and 2/3 saturation products possessed no power of stimulating the production of precipitins or complement binding substances, and were unable to sensitize or intoxicate guinea pigs either to themselves or to egg white. The 3/4 and 4/4 saturation products showed definite antigenic power for both precipitins and complement binding substances, and possessed slight sensitizing and intoxicating properties for guinea pigs. In all forms of antibody reaction the antigenic proteoses were not specific, in that egg white could be used as antigen in place of either fraction.

**Is hemoglobin antigenic?** C. L. A. Schmidt and C. B. Bennett (*Jour. Infect. Diseases, 25 (1919), No. 3, pp. 207–212*).—A brief review of the literature on the properties of hemoglobin as a possible antigen is given, and experiments initiated in the belief that the positive results obtained by some workers can be attributed to impurities in the preparation of hemoglobin are described and summarized as follows:

"Hemoglobin was prepared by three methods, one by crystallization from ammonium sulphate . . . and the other two by precipitation as oxyhemoglobin (with and without addition of alcohol) at low temperature and resolution by reduction. Each of the three preparations was recrystallized a number of times.

"Rabbits were immunized with each of the above preparations and both fixation and precipitin tests carried out. These were negative. In the sera of these rabbits no sensitizer was found which in the presence of alexin caused a hemolysis of dog cells. Agglutinins were likewise not produced. Hemoglobin failed to sensitize guinea pigs for the anaphylaxis reaction. The conclusion that hemoglobin is nonantigenic seems warranted.

"Doses of hemoglobin very much larger than the amount of globin which will cause toxic symptoms were injected both intravenously and intraperitoneally into guinea pigs, and toxic symptoms were not shown. Combination of toxic globin with hematin as occurs in hemoglobin renders it nontoxic, but does not, as in the instance when globin is combined with casein, give when rabbits are immunized antibodies for itself."

**Prophylactic and curative value of serums and vaccines in veterinary medicine,** D. G. Izcara (*Bol. Agr. Téc. y Econ., 11 (1919), Nos. 126, pp. 516–520; 127, pp. 595–604; 128, pp. 697–706*).—This is an extract from an address delivered at the National Congress of Medicine (Spain).

The first part deals with prophylaxis by normal virus, prophylaxis by attenuated virus or vaccines, immunization with dead vaccines, virus, and sensitized vaccines, immunization with serum alone (serum immunization) or with serum associated with a virus or vaccine (serum vaccination), and serotherapy. In the second part the applicability of one or another of these methods to the prophylaxis and treatment of various animal diseases is discussed. The diseases considered include cowpox, foot-and-mouth disease, contagious pleuropneumonia, rabies, tetanus, anthrax, glanders, gaseous gangrene,

dysentery, strangles, red fever of swine, infectious septicemia, hog cholera, and rinderpest. The serotherapy of snake bites and of wounds is also considered.

**Experimental gas gangrene. The protection by antiserum and antiserum mixtures,** M. NEVIN (*Jour. Infect. Diseases, 25 (1919), No. 2, pp. 178–188*).—The experiments reported were planned to show (1) the relative value of *Bacillus welchii* antitoxin and perfringens antimicrobial serum in the treatment of gas gangrene, (2) the value of various antiserums both singly and combined against edematous exudates produced by the inoculation of several anaerobic organisms, and (3) the protective value of various antiserums both singly and combined against mixed anaerobic infections. The experiments were conducted upon guinea pigs, the general plan being to inoculate the animal subcutaneously with the antitoxin or antiserum, and four days later intramuscularly with two minimal lethal doses of a living culture of the organism to be tested or with edematous fluid collected from animals inoculated with different combinations of anaerobes. The conclusions drawn from the study are summarized as follows:

"When *Vibrion septique* and *B. œdematiens* (*B. bellonensis*) are present in mixed infections the prophylactic use of the specific serums, even when diluted by another serum, is effective.

"Neither the *B. welchii* antitoxin nor the *B. welchii* (perfringens) antimicrobial serum is of any practical value in the prophylaxis of gas gangrene caused by a mixed infection due to several anaerobic bacilli, such as is commonly found in war wounds today. No accurate investigations of the amount of antitoxin contained in the antiperfringens (*B. welchii*) serum were made, and it is therefore impossible to say whether the protection afforded in pure *B. welchii* infections by the antimicrobial serum was due to the antitoxic principle contained in it, or to other antibodies present, or to a combination of the two. Further studies will be necessary to determine whether a serum of the highest potency can be produced by the inoculation of a sterile filtrate, producing a strict antitoxin, or by the inoculation of whole cultures, producing an antimicrobial serum."

**The bactericidal action of the whole blood of rabbits following inoculations of pneumococcus bacterins,** G. D. HEIST and S. SOLIS-COHEN (*Jour. Immunol., 4 (1919), No. 4, pp. 147–166*).—This is a continuation of the experiments on the bactericidal powers of whole blood previously noted (E. S. R., 40, p. 286), the immediate and practical object being to determine whether the test can be made use of in determining the efficiency of prophylatic inoculations of pneumococci, especially of type III. The work reported consisted of two phases, the first concerning the virulence of the pneumococci and the relation such virulence bears to their ability to grow in whole blood, and the second concerning the antibodies present in the blood to be examined and their action on the pneumococci.

The earlier conclusions in regard to the bactericidal activity of whole blood in vitro were confirmed. It was found that increasing the virulence of pneumococci for rabbits increased their ability to grow in rabbit blood in vitro, the mathematical expression of the ability of a strain of pneumococci to grow in the blood of normal rabbits in vitro thus serving as an expression of the virulence of the strain for rabbits.

The test for the bactericidal activity on pneumococci of the whole blood of inoculated rabbits was found to be a more sensitive index of the extent of immunity present as regards types I, II, and III than is the agglutination test, and to have an approximately quantitative value. The production by suitable inoculations of specific bactericidal activity in the blood of rabbits for pneumo-

cocci of one type was found to be accompanied by the production of slight bactericidal activity for other types.

**Studies upon the bacterial flora of samples of milk with high cellular counts as drawn from the apparently normal udder**, L. H. COOLEDGE (*Michigan Sta. Tech. Bul. 41 (1918), pp. 903–910, fig. 1*).—Work taken up in connection with investigations of the effect of diseases in the cow upon the milk deals with the relation of high cellular counts to *Bacterium abortus* infected, streptococci infected, and tuberculous udders, and to other abnormal conditions of the cow's udder, respectively. The first of the four parts of the work is here reported upon.

"Milk from actively *B. abortus* infected udders is found to have an average cellular count over five times as high as the apparently normal average. Udders artifically infected with a broth culture of *B. abortus* were quick to show an increase in the cellular count. *B. abortus* infection accounts for many of the samples of milk which have high cellular counts as drawn from the apparently normal udder. Many cases of high cellular counts can not be traced to *B. abortus* infection. Milk with high cellular counts caused by *B. abortus* infection can not be considered dangerous for human consumption as this organism has not been found pathogenic for man."

A list of nine references to the literature is appended.

**Contagious abortion in cattle**, C. D. MCGILVRAY (*Ontario Dept. Agr. Bul. 272 (1919), pp. 8, fig. 1*).—A popular summary of information.

**The cattle tick pest** (*Aust. Inst. Sci. and Indus. Bul. 13 (1919), pp. 40, pl. 1, figs. 14*).—A revised and enlarged edition of the bulletin previously noted (E. S. R., 38, p. 286).

**The pathology and epizootiology of louping ill**, S. STOCKMAN (*Jour. Bd. Agr. [London], 26 (1919), No. 1, pp. 24–39, pls. 4*).—A more detailed account has been noted (E. S. R., 40, p. 383).

**A chronic pox-like infection in goats and its successful treatment**, R. V. STONE and C. W. FISHER (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 5, pp. 536–543*).—"A condition in goats, benign in character but of economic importance through loss in milk production and flesh, has been observed. Lesions in early stages resemble goat-pox. Whether true goat-pox or a condition having lesions simulating those observable in goat-pox has not been determined. However, a pure Gram positive staphylococcus having an orange pigment and producing marked hemolysis on uncooked blood agar has been isolated from every specimen taken.

"Bacterins prepared from this organism produce a rapid recovery in cases affected. This therapeutic value may be specific or nonspecific, but the organism has been demonstrated as being particularly virulent for goats but nonvirulent for guinea pigs and rabbits. Three distinct forms of infection have been successively treated with bacterins. These forms are (a) arthritis, (b) exanthemata, [and] (c) subcutaneous multiple abscesses. Cases in which bacterin therapy is not employed do not recover rapidly but may persist at least a year and a half."

**Observations concerning the dissemination of hog cholera by insects**, M. DORSET, C. N. MCBRYDE, W. B. NILE, and I. H. RIETZ (*Amer. Jour. Vet. Med., 14 (1919), No. 2, pp. 55–60*).—This is a report of studies by agents of the Bureau of Animal Industry of the U. S. Department of Agriculture presented at the annual meeting of the U. S. Live Stock Sanitary Association, held in Chicago in December, 1918. The studies were conducted with the house fly and lesser house fly, representing the nonbloodsucking species; and the stable fly, representing the bloodsucking species.

The experiments seem to show that house flies are capable of taking up and harboring hog cholera virus, and that under experimental conditions they transmitted the disease in a certain number of cases to healthy pigs. In the attempt to determine whether the spread of hog cholera occurs in this way in nature, screened pens were used. In each of the fly-tight pens one or two susceptible pigs were placed and flies caught daily with traps and nets in the virus barn were introduced. While large numbers of such flies were introduced daily for 24 days in two cases and for 31 days in another, all the pigs remained perfectly well and later were proved susceptible, notwithstanding that several thousand flies had been introduced into each pen. In two other experiments a smaller number of flies, for the most part caught feeding on the eye secretions of sick pigs, were introduced into the pens, with the result that one of the two pigs developed cholera within 25 days after the first exposure to the flies and 6 days after the last exposure.

Screened cage experiments with stable flies led the authors to believe that they take up and harbor the virus of hog cholera, and that they may under favorable conditions convey hog cholera to healthy pigs. "The negative results of the screened pen experiments with house flies leads us to doubt whether the house fly is an important channel for the conveyance of cholera from farm to farm, though the possibility of the disease being conveyed in that way is not, in our opinion, excluded."

**A new strongylid from the hog**, A. Railliet, A. Henry, and J. Bauche (*Bul. Soc. Path. Exot., 12 (1919), No. 6, pp. 324–332, figs. 5*).—Under the name *Bourgelatia diducta*, the authors describe a form representing a new genus and species found in the cecum and colon of the domestic hog at Huế (Annam).

**The blood pressure of the horse**, S. Schilling (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 4, pp. 401–416, figs. 5*).—Noted from another source (E. S. R., 41, p. 287).

**Epizootic lymphangitis of solipeds**, A. Boquet, L. Nègre, and G. Roig (*Rev. Gén. Méd. Vét., 27 (1918), Nos. 323, pp. 553–566, figs. 2; 324, pp. 617–634, fig. 1*).—In this article the authors deal with the parasitology, treatment, and prophylaxis of epizootic lymphangitis in the horse and mule. A report of the pathogenic action and characteristics of the cryptococcus is included, as is a bibliography of 23 titles.

**Contribution to the study of ulcerative lymphangitis of the horse**, G. Mullie (*Rec. Méd. Vét., 95 (1919), No. 1–2, pp. 34–50*).—A discussion of the symptoms, therapeutics, and prophylaxis, based upon observations and experiments during the war.

**Report on ulcerative lymphangitis in the A. E. F.**, A. A. Leibold (*Amer. Jour. Vet. Med., 14 (1919), No. 8, pp. 387–391, 419*).—The author reports on bacteriological examinations of 165 horses and mules of the American Expeditionary Forces suffering from various forms of lymphangitis which were made during 1917 and 1918. In 72.62 per cent of the cases streptococci alone were found, of which 84 per cent were hemolytic; Preisz-Nocard bacillus alone in 6.06; streptococci with staphylococci in 6.06; staphylococci alone in 4.24; streptococci with Preisz-Nocard bacillus in 2.42; staphylococci with Preisz-Nocard bacillus in 0.6; cryptococcus of Rivolta alone in 2.42; and no cultures in 7.21 per cent.

It is pointed out that during the winter of 1917–18 and the summer of 1918 lymphangitis in its various forms became quite a serious problem among the horses and mules in France. "Ulcerative lymphangitis, according to the author's observations, exceeded all other forms many times, occurring in 97.5 per cent of cases of lymphangitis. It has a decided tendency to run a protracted course, often incapacitating animals for weeks." The fact that strepto-

cocci were found in such a high percentage of the cases and in the majority of the cases in pure culture, and also that strains injected into laboratory animals proved pathogenic, led to the belief that they are the cause of one form of ulcerative lymphangitis.

**The streptococci of equines**, F. S. JONES (*Jour. Expt. Med., 30 (1919), No. 2, pp. 159–178, pl. 1*).—"The lower nasal mucosa and the pharynx of 30 eastern and 23 western horses have been examined for streptococci. Eight of the eastern horses carried nonhemolytic streptococci on the nasal mucosa. From the pharynx of 6, nonhemolytic streptococci were cultivated. The throats of 18 contained strains of the hemolytic type. The nasal mucosa of the eastern horses failed to show hemolytic streptococci. Eight western horses carried nonhemolytic streptococci in the nasal passage; 8 also harbored the hemolytic type. Twenty-two strains were isolated from the pharynx. Eleven were hemolytic.

"Among all the nonhemolytic nasal strains those capable of fermenting mannite predominate. Those of the nonhemolytic types from the pharynx of both classes of horses may or may not ferment lactose but all do ferment either raffinose or inulin. In no instance have any of the nonhemolytic types proved pathogenic for mice. The hemolytic strains from the nasal mucosa of the western horses were all of the *Streptococcus pyogenes* type. They were pathogenic for mice and rabbits. One strain from the pharynx of an eastern horse and 8 from the throats of the western horses were of the same species. All the others corresponded closely in their fermentation reactions with nonhemolytic streptococci from the same region.

"The streptococci from pathological sources were all hemolytic. They have fallen into two groups; the larger group (*S. pyogenes*) produced acid in dextrose, lactose, saccharose, maltose, milk, and salicin, but failed to change the reaction of broth containing raffinose, inulin, or mannite. The streptococci of the smaller group (*S. equi*) differ only in their inability to ferment lactose or acidulate milk. Both types are pathogenic for mice. Rabbits are usually more resistant.

"*S. pyogenes* has been isolated from 18 of 22 cases of influenza, 3 of 6 cases of strangles, and from 8 of 9 abscesses. *S. equi* was observed in 4 horses suffering from influenza, and 5 others affected with strangles. This species was also found in an abscess and associated with both rhinitis and pharyngitis."

**Scrapie**, J. P. M'GOWAN (*Jour. Compar. Path. and Ther., 31 (1918), No. 4, pp. 278–290*).—This is a reply to the criticism by M'Fadyean (E. S. R., 41, p. 85) of the author's work previously noted (E. S. R., 32, p. 276).

**Sarcosporidia as the cause of scrapie**, J. M'FADYEAN (*Jour. Compar. Path. and Ther., 31 (1918), No. 4, pp. 290–299*).—A further critical review of the work by M'Gowan (E. S. R., 32, p. 276), in view of the explanations set forth in the paper noted above.

**Traumatic action of Strongylus equinus**, S. E. PARODI and V. WIDAKOVICH (*Rev. Zootéc., 6 (1919), No. 64, pp. 277–282, pls. 3*).—A report upon the injury caused by this parasite.

**The differentiation and distribution of the paratyphoid enteritidis group.—VI, Avian paratyphoid bacilli: A comparative study of B. pullorum and B. sanguinarium**, F. W. MULSOW (*Jour. Infect. Diseases, 25 (1919), No. 2, pp. 135–162*).—The studies here reported, which are in continuation of the series previously noted (E. S. R., 40, p. 478), are summarized as follows:

"There is little exact knowledge at present concerning the distribution of *B. pullorum* and *B. sanguinarium*, but it appears that both cause considerable losses to poultry raisers in many parts of the United States. There has apparently been some confusion at times in differentiating *B. aviseptieus* from

*B. sanguinarium*. *B. aviscpticus*, however, may generally be distinguished from *B. sanguinarium* by its action in milk, indol production, fermentation of carbohydrates, agglutination reaction, and pathogenesis. *B. pullorum* and *B. sanguinarium* do not produce indol, generally form hydrogen sulphid in a lead acetate medium, and produce a temporary acidity in milk, but later alkali is formed. *B. sanguinarium* usually produces alkali in a shorter time than *B. pullorum*. The casein is digested by most strains of these organisms. As regards fermentation, *B. pullorum* produces acid and generally gas in several carbohydrates. *B. sanguinarium* produces acid but no gas in the same carbohydrates, and in addition produces acid in dulcite and maltose. There is some variation in the reactions in maltose. Some strains of *B. pullorum* produce slight amounts of acid after several days' incubation, and two strains have produced acid and gas quite promptly in maltose.

"Agglutination tests with these organisms have shown that there is an antigenic relation between these organisms and *B. typhosus*, *B. enteritidis*, and *B. abortus-equinus*. Such antigenic relations were not observed between these avian strains and *B. aviscpticus*, *B. dysenteriæ*, *B. paratyphosus* A and B, *B. suipestifer*, *B. proteus*, and *B. coli*. Absorption tests will differentiate quite readily between *B. typhosus* and these avian strains. Agglutination and absorption tests with serums of rabbits immunized toward these avian types suggest an antigenic relation between *B. typhosus*, *B. enteritidis*, and these avian strains.

"Feeding experiments indicate that laboratory cultures of these organisms will rarely produce an injurious effect on laboratory animals. Two freshly isolated strains of *B. sanguinarium* and one of *B. pullorum* were also fed to various animals without producing serious effects. It has been observed from inoculations that the rabbit is the most susceptible laboratory animal to the strains studied. It generally requires from 2 to 3 cc. of a 24-hour broth culture injected intraperitoneally to produce a fatal infection in a rabbit weighing about 2.000 gm. A few freshly isolated strains were not more virulent for rabbits, guinea pigs, mice, and rats than cultures kept in the laboratory for some time. *B. pullorum* and *B. sanguinarium* produce a toxin when grown under proper conditions which is quite poisonous to rabbits. The action of the toxin produced appears to be the same for the two strains.

"These avian strains may be differentiated from *B. typhosus* by their lack of motility, their fermentation reactions in rhamnose and sorbite, and absorption tests with immune serums. Serologic tests and certain fermentative reactions may be used to differentiate these organisms from *B. dysenteriæ*. They may be differentiated from other members of the paratyphoid enteritidis group by morphologic and cultural characteristics and serologic tests. *B. avisepticus*, as has been mentioned before, may be differentiated in many ways from *B. sanguinarium* and *B. pullorum*.

"*B. pullorum* may be distinguished from *B. sanguinarium* by the inability of the former to ferment dulcite, while the latter ferments this carbohydrate. Also, the former organism does not generally produce acid in maltose and generally produces gas in several of the carbohydrates. *B. sanguinarium*, on the other hand, generally produces acid promptly in maltose and does not produce gas in any of the carbohydrates. Rhamnose is fermented promptly by *B. pullorum*, while *B. sanguinarium* does not produce acid before 48 hours' incubation. It appears, therefore, that there are sufficient differences between *B. sanguinarium* and *B. pullorum* to regard them as separate types."

**Lead poisoning in waterfowl**, A. Wetmore (*U. S. Dept. Agr. Bul. 793 (1919), pp. 12, pls. 2*).—This is a report of studies of a serious affection of ducks and other waterfowl in the United States, intended for sportsmen, naturalists, and

others interested in game birds. A summary of the data here presented has previously been noted from another source (E. S. R., 39, p. 687). The work was carried on in connection with investigations of duck sickness found to be due to the toxic action of certain soluble salts in alkalis, a report of which has previously been noted (E. S. R., 39, p. 460).

The author can offer no suggestions of a practical nature to alleviate this danger to waterfowl, which is due to eating shot. He has been able to effect a cure in a few individuals by treating them with magnesium sulphate.

**The loco-weed disease**, C. D. MARSH (*U. S. Dept. Agr., Farmers' Bul. 1054 (1919), pp. 19, figs. 11*).—This is a popular account in which the distribution, characteristics, and effects of loco weeds upon animals eating them are described, together with the proper methods of feeding and treating such animals.

## RURAL ENGINEERING.

**Tests to determine pressures due to hydraulic fills**, A. W. GOLDBECK (*Engin. News-Rec., 80 (1918), No. 16, pp. 758–760, figs. 5*).—Experiments on the use of the device employed by the Bureau of Public Roads of the U. S. Department of Agriculture for measuring the distribution of pressure through earth fills, to determine pressures due to hydraulic fills in reclamation dike and dam construction are reported. The tests consisted in filling a standpipe with finely divided clay in the same way that the core of a hydraulic fill dam is placed, and then measuring the horizontal and vertical pressures at various heights in the standpipe so as to obtain an idea of the pressure in the core of a dam at various stages of the fill.

"Briefly, the scheme of pressure measurement with this apparatus consists of the equilibration of the earth pressure acting on a sensitive cell by means of air pressure within the cell, detection of the instant of equilibration by the breaking of electrical contact within the cell, and reading the air pressure within the cell at that instant by means of an accurate pressure gauge."

"Readings and pumping have been continued . . . intermittently for a period of more than four months, and the mud line has been rising with a corresponding increase of pressure readings. There is a very noticeable difference in the consistency of the mud from top to bottom, that at the top being quite liquid and that at the bottom more viscous."

"The results seem to point to the reliability of the measuring apparatus for accurately measuring the pressures in such fills. In view of the fact that the cells function just as sensitively now as on the day they were buried in the fill, it would seem that they could very well be employed as a field apparatus for controlling the rate of construction and shape of cross section of hydraulic-fill dams."

**Tables of cubic contents of levee embankments**, A. A. STILES (*Tex. State Reclam. Dept. Bul. 5 (1917), pp. VII+212, pl. 1*).—Tables of data on the cubical contents of embankments and excavations are given as prepared by the Texas State Reclamation Department.

**Factors for obtaining cubic yards on sloping cross sections from cubic yards on level cross sections**, A. A. STILES (*Tex. State Reclam. Dept. Bul. 5A (1918), pp. 25*).—These tables were prepared by the Texas State Reclamation Department as a supplement to Bulletin 5 noted above.

**Tables of velocity of water in open channels derived from Kutter's formula**, A. A. STILES (*Tex. State Reclam. Dept. Bul. 6 (1917), pp. VII+130*).—Velocity tables are given based on Kutter's formula for different values of the coefficient or roughness $n$, as prepared by the State Reclamation Department of Texas.

Latitude, longitude, and sea level elevation of bench marks in Texas, A. A. Stiles (*Tex. State Reclam. Dept. Bul. 7 (1917), pp. VI+284*).—This handbook gives the location and elevation of bench marks established in Texas by the State Reclamation Department.

Report of hydrometric surveys (stream measurements) for the calendar year 1916, P. M. Sauder, V. A. Newhall, and W. H. Storey (*Dept. Int. Canada, Irrig. Branch, Rpt. Hydrom. Surveys, 1916, pp. 609, pls. 5, figs. 3*).—This report presents the results of measurements of flow made on streams, irrigation ditches, and canals in Alberta and Saskatchewan during 1916.

The phosphorus, potassium, and nitrogen content of the waters of the intermountain region, J. E. Greaves and C. T. Hirst (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, pp. 451–454*).—Determinations made at the Utah Agricultural College of the total potassium, phosphorus, and nitrogen in several hundred samples of water representing 58 streams in Utah, the majority of which are extensively used for irrigation, are reported.

The analyses indicate that "the quantity of potassium carried to the soil by one acre-foot of water varies from 2.2 to 133.8 lbs., the phosphorus from zero to 14.9 lbs., and the nitrogen from traces to 66.1 lbs. Although only a few of the waters analyzed were carrying sufficient phosphorus, potassium, and nitrogen to the soil to supply plants with the necessary quantities of the respective elements, yet it is evident in a number of cases that the quantity of plant food carried to a soil by the irrigation water is sufficient to assist in maintaining the fertility, for it is quite certain that where the waters are rationally used the quantity of potassium, phosphorus, or nitrogen carried to the soils exceeds that removed in the drain waters."

The biology of waterworks, R. Kirkpatrick (*Brit Museum [Nat. Hist.], Econ. Ser., No. 7 (1917), pp. IV+58, figs. 18*).—The purpose of this pamphlet is to outline broadly the relation of natural history to water supplies. The main subjects dealt with are animals and plants that may be associated with water supplies and biology in relation to water purification.

Chlorination of water, J. Race (*New York: John Wiley & Sons, Inc., 1918, pp. VIII+158, figs. 28*).—This book is a compilation of information on the various aspects and methods of water purification by chlorination.

Chlorinated lime and halazone in the disinfection of drinking water, B. Fantus (*Jour. Infect. Diseases, 24 (1919), No. 3, pp. 191–203, figs. 4*).—Experiments to compare the value of chlorinated lime with halazone (*p*-sulphondichloraminebenzoic acid) as a disinfectant for drinking water led to the conclusions that "chlorinated lime is a more efficient water disinfectant than halazone, compared on the basis of active chlorin. It is . . . also a great deal cheaper. Hence there is no reason for employing halazone in water disinfection, excepting when its superior tablet-making qualities render its use advantageous."

Sterilization and purification of water with isotonic sodium hypochlorite solution, W. G. Fralick (*Med. Rec. [N. Y.], 93 (1918), No. 6, pp. 239, 240*).—Experiments on the sterilization of water with isotonic sodium hypochlorite are briefly reported, from which the conclusion is drawn that water can be sterilized with small quantities of isotonic sodium hypochlorite solution and subsequently neutralized by the addition of peroxid of hydrogen. Water so treated was found to be sterile, free from taste, and palatable.

Loads on highway bridges (*London: The Concrete Inst., 1918, pp. 39, pl. 1, figs. 31*).—This is a report of a joint committee representing the Institution of Municipal and County Engineers and the Institution of Municipal Engineers, giving notes, diagrams, and a table of loads for highway bridges based on three bridge classifications.

**Test tractive efficiency of concrete roads**, E. N. HINES (*Concrete [Detroit, Mich.], 14 (1918), No. 2, pp. 56, 57*).—Tests in five counties in Michigan are reported in which a 2-ton truck loaded to capacity was driven over 238.25 miles of concrete, gravel, and dirt roads. The average speed in miles per hour was 16.4 for concrete roads, 9.5 for gravel roads, and 4.6 for dirt roads.

A 10-mile test of a 2-ton truck on a concrete road and on an ordinary country dirt, gravel, and sand road to determine relative gasoline consumptions showed that 1.25 gal. of gas and 42 minutes of time were required on the concrete, as against 2 gal. and 1 gill of gas and 1 hour and 24 minutes of time on the country road.

**Concrete construction for rural communities**, R. A. SEATON (*New York: McGraw-Hill Book Co., Inc., 1918, 2. ed., pp. XI+223, pl. 1, figs. 95*).—This is the second edition of this book (E. S. R., 36, p. 188), in which the specifications for Portland cement have been revised.

**Absorption tests of slag, stone, and gravel concrete**, O. R. SMITH (*Concrete [Detroit, Mich.], 14 (1919), No. 4, pp. 144*).—Comparative absorption tests of slag, stone, and gravel concrete showed that as far as absorption alone is concerned there was very little difference between the three types.

**Determination of stresses in wire rope as applied to modern engineering problems**, J. F. HOWE (*Jour. Amer. Soc. Mech. Engin., 40 (1918), No. 12, pp. 1016–1021, figs. 8*).—This is a mathematical analysis of the stresses in wire rope, from which formulas for the strength of strands and the whole rope in static and moving tension, on inclines, under indirect or induced stresses and reverse bending, and suspended horizontally supporting a load are derived. It is the opinion of the author that specifications for wire rope should include a tension test, and possibly a bending and torsion test, but that an elongation test is unfair and untrue to actual conditions.

**Concentrated load tests of yellow pine beams for shear**, L. R. MANVILLE and C. R. HILL (*Engin. News-Rec., 83 (1919), No. 2, pp. 69–71, figs. 4*).—Tests of long-leaf yellow pine beams are briefly reported, from which it is concluded that, with a concentrated load placed a distance from the end support of a beam equal to the depth of the beam, the beam will hold as much as the timber will stand in cross-grain bearing over the supports, and no horizontal shear failure may be expected.

It is recommended that for the strength of beams in horizontal shear values roughly 50 per cent greater than ordinary design unit stresses may be used, if the unit shear is computed by the usual method, and if heavy concentrated loads occur near the point of support or within about 1½ times the depth of the beam. "Design unit stresses in horizontal shear such as 120-lb. per square inch for long-leaf yellow pine appear to be very conservative for application to maximum end shear under concentrated loads, although no doubt within safe design limits with a load three depths of the beam from the support. This stress could be increased as recommended above for applied loads nearer the reaction. Timber inspected and graded under the rules proposed by the U. S. Forest Service, dated 1915, which would largely eliminate critical defects, may be used with higher unit stresses, especially in horizontal shear in which defects such as checks and shakes so often play an important part."

**Prolonging life of farm timbers**, J. B. BERRY (*Ga. State Col. Agr. Circ. 66 (1917), pp. 8, figs. 6*).—This bulletin deals briefly with the creosoting of farm timbers for their preservation. Posts, to be treated, must be peeled, removing the inner bark especially, and thoroughly seasoned. The temperature of the oil must be controlled within the limits of from 200 to 220° F., and should never exceed the latter. A deep penetration of the oil should be secured on the part of the post to go into the ground and for a foot above the ground.

**Results of long-time tests of creosote treated fence posts**, C. H. TEESDALE (*Engin. News-Rec., 82 (1919), No. 26, p. 1254*).—Tests conducted by the Forest Service of the U. S. Department of Agriculture in cooperation with the University of Minnesota on over 2,000 fence posts treated and set during 1908 and 1909 are reported.

At the last inspection in 1918, 73.5 per cent of the basswood treated with coal-tar cresote and 78 per cent of that treated with water-gas-tar creosote were still sound. In the case of red oak 94.5 per cent treated with coal-tar creosote and 92.5 per cent treated with water-gas-tar creosote were still sound. It was found that the basswood posts did not take the treatment well, and for this reason this species is not recommended for open-tank treatment.

**Fencing the farm**, W. J. RUTHERFORD (*Saskatchewan Dept. Agr. Bul. 51 (1917), pp. 12, figs. 10*).—This bulletin gives general information on farm fencing, with special reference to Saskatchewan conditions.

With reference to posts it is stated that, "in all the tests that have been made with wood, round cedar posts 4 to 6 in. at the small end, cut green in December or January, peeled and seasoned, are the most durable, the life being about 18 to 20 years. The less sapwood the longer lived will be the post, other things being right. Creosoting timber helps to prolong its life. Split cedar posts are cheaper and, if creosoted, give very good satisfaction. Tamarack and spruce are used, but their life is not so long as cedar. Willow and poplar are constantly needing repairs and substitutions after 3 years of use."

It is also stated that a number of years of experiment with steel posts have proved them strong and durable.

"A very effective fence for all practical purposes, except the turning of coyotes and dogs, is the 8-strand 45 in. fabric with one barb wire placed 8 in. above. All these woven wire fabrics should be made of No. 9 gauge horizontals and 11 or 12 gauge uprights, the latter being placed 12 to 16 in. apart. The larger wire is stronger and is better galvanized, which means longer life for the fence and less repairing."

**The Diesel engine: Its fuels and its uses**, H. HAAS (*U. S. Dept. Int., Bur. Mines Bul. 156 (1918), pp. VIII+133, pls. 16, figs. 57*).—This report discusses recent developments in the design and construction of the Diesel engine, the fuels suitable for burning in it, and the uses to which it is particularly adapted, with special reference to medium and small power requirements.

With reference to economy, it is stated that although explosion oil engines are materially cheaper in first cost they consume considerably more fuel and lubricating oil than Diesel engines. Their fuel consumption at fractional loads also increases at a greater rate.

"The mechanical efficiencies of four-stroke engines at full load vary from 75 to 82 per cent, 80 per cent being usual for high-grade, low-speed engines of medium and large powers. The engine efficiency, exclusive of the air compressor, is 85 to 90 per cent. The mechanical efficiency of engines having a two-stroke cycle seldom exceeds 70 per cent and may be as low as 65 per cent in high-speed engines."

"The indicated thermal efficiency of the Diesel engine having a four-stroke cycle varies from 45 per cent at full load to 47 per cent at half load, and the effective thermal efficiency from 37 per cent at full load to 30 per cent at half load, which represents the best practice. As regards engines having a two-stroke cycle, the figures are 10 to 15 per cent lower."

"The volumetric efficiency of engines having a two-stroke cycle is generally below unity. For slow-speed four-stroke engines a volumetric efficiency of 90

per cent can be reached, which decreases to 85 per cent for high-speed engines, and for extreme speeds may be even lower. These values presuppose high-grade engines with mechanically operated valves."

With reference to the effect of high altitudes, it is stated that the horsepower rating of a Diesel engine decreases 3 per cent for every 1,000 ft. of added altitude.

"The high commercial value of the Diesel engine lies in its unsurpassed fuel economy and in its ability to burn low-priced liquid fuels with high boiling points. This great fuel economy is not confined merely to medium or large sized units, for the smallest engine has nearly the same fuel economy as the largest."

Data are given which indicate "that although the absolute fuel price for fuel oil may be several times higher than that of coal in the same market, power may be generated more cheaply with the Diesel than with the steam engine."

The disadvantages of Diesel engines are stated as high consumption of lubricating oil and high installation cost, including heavy foundations.

**Length of motor truck stop varies inversely as braked load** (*Engin. News-Rec., 81 (1918), No. 18, pp. 799, 800*).—Braking tests conducted by G. W. Smith of motor trucks and automobiles on a concrete road having a thin coating of oily dust showed the advantage of concentrating a large proportion of the load on the braked wheels. It was found that the coefficient of friction for rubber tires on dry paving was from 0.475 to 0.53. With a uniform speed of 20 miles per hour the shortest stops were made by trucks having a relatively high percentage of the total weight carried by the rear or braked wheels, while the longest stops were made by a touring car with relatively light wheel loading.

A second set of tests by L. D. Hemman, in which solid rubber tires were used for 3, 2, and 0.5 ton trucks and pneumatic tires for the automobile, showed that skidding of light trucks took place on wet asphalt when the brakes were applied with a uniform speed of 15 miles per hour. When the asphalt was very wet with a slight coating of sloppy snow, the skidding tendency of the lighter machines was greatly increased, while the larger trucks skidded only 2 or 3 feet out of line.

**Important and neglected features of tire maintenance,** A. F. Masury (*Engin. News-Rec., 82 (1919), No. 26, pp. 1262–1264, figs. 5*).—Data are reported showing that for large motor trucks tire cost and fuel cost are normally about equal. On lighter trucks the tire cost is slightly less than the fuel cost unless pneumatic tires are used, when the tire cost will slighly exceed the fuel cost. In this connection a warning is given against overloading, overspeeding, neglecting cuts and tears, spinning, skidding, and sliding the wheels, and wheel misalignment.

**Directory and specifications of farm tractors** (*Farm Machinery, No. 1442–1443 (1919), pp. 16, 108*).—This directory contains data on 253 farm tractors of 170 different makes.

**Mole plows worked by horses** (*Jour. Bd. Agr. [London], 25 (1918), No. 1, pp. 36–40, figs. 5*).—Drawings showing the details of mole plows in use for draining land quickly are given.

**A barn for the small farm,** H. H. Musselman (*Michigan Sta. Quart. Bul., 2 (1919), No. 1, pp. 32–34, figs. 2*).—A ground plan and some construction details for a barn for a small farm keeping from 2 to 4 horses and 10 to 15 cows are given.

**Practical hog houses for Indiana,** C. A. Norman and J. W. Schwab (*Purdue Univ., Dept. Agr. Ext. Bul. 76 (1918), pp. 8, figs. 12*).—This bulletin gives draw-

ings and brief specifications for individual and centralized hog houses prepared with reference to Indiana conditions.

**Silos and silage in Arkansas**, H. E. DVORACHEK (*Arkansas Sta. Bul. 164 (1919), pp. 3–16*).—This bulletin discusses the various types of silos in common use, and gives general information on their construction with special reference to Arkansas conditions.

**Stall construction**, H. H. MUSSELMAN (*Michigan Sta. Quart. Bul., 2 (1919), No. 1, pp. 35, 36, fig. 1*).—The details of construction of a cow stall built of concrete, steel, and wood are illustrated and briefly described.

**Greenhouse heating**, A. G. KING (*Dom. Engin., 88 (1919), No. 8, pp. 340–342, figs. 5*).—Information is given on estimating for and installing heating apparatus for greenhouses, including diagrammatic illustrations.

**Cost of and revenue from electric heating on the Minidoka project**, B. DIBBLE (*Reclam. Rec. [U. S.], 10 (1919), No. 2, pp. 78–81*).—This is an analysis of the cost of domestic electric heating for all the towns and isolated residences on the Minidoka irrigation project using power supplied by the project generating station.

"The indications are that electricity at $2 per month per kilowatt will compete with coal at $8 per ton. It has been found on the Minidoka project that the average season for the heating load is from five to six months. In other words, the total consumption of electricity for heating is equivalent to five or six months' continuous use of the maximum demand. Therefore a retail revenue can be expected from this business of from $10 to $12 per kilowatt per season."

"It can be said that electric heating is sometimes justified as a 'by-product' load, but that rarely, if ever, will it be economically feasible to develop electricity from water power for the prime purpose of using it generally to heat buildings where fuel can be obtained at reasonable prices."

**Analysis of electric cooking situation**, S. M. KENNEDY (*Elect. World, 72 (1918), No. 8, pp. 351, 352*).—An analysis of the electric cooking load of a central station in southern California supplying over 3,000 electric ranges, of which 95 per cent are in private houses, showed that (1) the electric cooking load is a desirable load, (2) the electric range is satisfactory to its consumers, and (3) electric cooking service is along the lines of conservation of both food and fuel. The average annual bill for electric cooking on this system is said to be about $45, and for combination cooking and water heating the average is $75.

**The relative merits of cast-iron, wrought-iron, and steel pipe for house drainage purposes**, W. P. GERHARD (*Jour. Franklin Inst., 187 (1919), No. 1, pp. 99–109, figs. 8*).—Fracture, threading, corrosion, acid, manganese, and microscopic tests of cast-iron, wrought-iron, and steel pipe were conducted from which it was found that "extra heavy cast-iron soil pipe is a satisfactory material from the corrosion point of view. It is unsatisfactory as regards the calked joints. These become affected by changes in temperature, and do not remain tight under all conditions of service. The screw joint of welded pipe is superior to the calked joint, provided the threads are so cut and the recessed drainage fittings so tapped that the pipe can be screwed well into the shoulder of the fitting. Portions of the thread remaining exposed to view should be protected against external corrosion. The evidence furnished by the investigation leaves no doubt as to genuine wrought-iron pipe being a far more durable material for house drainage purposes than steel pipe."

**Rural methods of waste disposal**, H. D. EVANS (*Bul. State Dept. Health Maine, n. ser., 2 (1919), No. 1, pp. 24, figs. 12*).—This bulletin deals briefly with design and construction of sanitary privies, sewage tanks, and absorption areas, with special reference to Maine conditions. The pail privy is considered

to be better than the tight-vault privy or the biological privy in that its contents can be more easily and safely disposed of. The biological privy is considered of little use under Maine conditions.

**Rural drainage**, T. J. LAFRENIÈRE (*Bul. Sanit. Quebec, 18 (1918), No. 1, pp. 170–183, figs. 7*).—This report deals briefly with sewage disposal on farms and in rural communities in the Province of Quebec, and gives drawings and brief specifications for sanitary privies and disposal systems consisting of sedimentation tanks and tile absorption areas.

**The treatment of sewage from single houses and small communities**, E. B. PHELPS (*Pub. Health Rpts. [U. S.], 34 (1919), No. 7, pp. 271–276, pls. 2, figs. 2*).—Experiments on the disposal of residental and institutional sewage are reported. The institutional sewage flow was 100 gal. per capita, and in parts per million contained 7.9 parts ammoniacal nitrogen, 20.4 parts organic nitrogen, and 981 parts total solids, and had an oxygen demand for 24 hours at 20° C. (68° F.) of 121 parts per million. The residental-sewage flow was 21 gal. per capita, and contained 48 parts ammoniacal nitrogen, 65 parts organic nitrogen, and 1,360 parts total solids per million, and had an oxygen demand of 263 parts per million.

Experiments with preliminary tank treatment were confined to the biolytic tank and the Imhoff tank. The latter was found particularly well adapted to the existing requirements. An average removal of 91 per cent of the settleable solids was obtained with the residental sewage and 97 per cent with the weaker institutional sewage.

Experiments with sand filters showed that with moderately course sand having an effective size of 0.35 mm. the area required varied with the dilution of the sewage. About 30 sq. ft. of superficial sand area per capita was required for the residental sewage and 45 sq. ft. for the institutional sewage. Sand layers 24 in. in depth were satisfactory.

Experiments with trickling filters comprised studies of distribution and filter materials. It was found that the lath filter with tipping distributor possessed advantages over all other types tested. This filter is described in detail and illustrated.

"The filter proper . . . is built up of layers of ordinary laths, the laths of adjacent layers lying at right angles to one another and those of each layer being parallel and spaced with clear openings of 3 in. Closer spacing down to ¾ in. yielded less satisfactory results. The laths of each layer are also so spaced that they come over the center of the open space in the second layer below. A filter depth of 6 ft. yields an effluent of high degree of oxidation, and one of 3.5 ft. yields an effluent sufficiently oxidized to satisfy the requirements of most situations. A total filter volume of 8 cu. ft. per capita is required."

"The performance of this filter is much superior to that of a good trickling filter of stone, and in 6 ft. depths, with subsequent sedimentation, is approximately equal to that of a well-operated sand filter 2 ft. in depth."

**Sewage disposal**, E. D. RICH and F. G. LEGG (*Mich. State Bd. Health Engin. Bul. 11 (1917), pp. 24, figs. 14*).—This is a nontechnical discussion of the subject of the treatment and removal of liquid wastes, prepared for the guidance of the governing bodies of the smaller communities.

**Sewage disposal**, L. P. KINNICUTT, C. E. A. WINSLOW, and R. W. PRATT (*New York: John Wiley & Sons, 1919, 2. ed., pp. XVII+547, figs. 141*).—This is a second edition and complete revision of this work (E. S. R., 24, p. 616) in which the authors have attempted to introduce new data and recent viewpoints in connection with all the topics treated.

In particular the chapters on screening, sludge disposal, and chemical precipitation have been entirely reconstructed and much enlarged. A discussion

of the Miles acid process is included in connection with chemical treatment. New chapters have been added treating of the newer processes of two-story tank treatment and purification by means of activated sludge. New chapters have also been added which discuss, respectively, the broad principles underlying the selection, design, and operation of a sewage treatment plant and the disposal of excretal wastes from houses and institutions which are not connected with sewerage systems.

**A new form of septic tank,** DEW. H. WYATT (*Dom. Engin., 87 (1919), No. 9, pp. 379, 380, fig. 1*).—A new form of septic tank for private sewage disposal in rural districts is described and diagrammatically illustrated which is made entirely of vitrified pipe shapes.

**Grease interception from house sewage,** H. J. BELMONT (*Dom. Engin., 88 (1919), No. 6, pp. 249–251, 285, figs. 5*).—Information is given on the construction of grease traps, together with drawings of approved types.

**Treatment and disposal of creamery wastes,** E. B. PHELPS (*Pub. Health Rpts. [U. S.], 33 (1918), No. 49, pp. 2169–2174, pl. 1*).—Experiments conducted in cooperation with the Dairy Division of the U. S. Department of Agriculture on the purification and disposal of creamery sewage are reported. This sewage consisted of wastes from washing cans and cleaning and rinsing churns, together with a small amount of milk, cream, and buttermilk spilled on the floor. The experimental disposal plant as used consisted of a septic tank and two sand filters.

"In May, 1916, the plant was put in operation, the sand filter being operated at a nominal rate of 25,000 gal. per acre per day, and the septic tank on the basis of a 12-hour storage period. The results of the operation were excellent almost from the start. During July the nominal rate of filtration gradually increased to approximately 70,000 gal. per acre per day, at about which point it was maintained throughout the investigation. With the advent of cold weather a noticeable reduction occurred in the degree of nitrification, and a somewhat less marked effect was shown by the relative stability and oxygen demand values. The degree of purification was always satisfactory for discharge into a comparatively small volume of diluting water in cold weather, and the spring of 1917 brought with it increased biological activity and resulting improvement in quality of the effluent. A noticeable and quite unexpected result was the complete neutralization of the characteristic acidity of the settled wastes, the average values for 18 months being 226 parts per million of acidity in the settled waste and 356 parts per million of bicarbonate alkalinity in the filter effluent."

"The results of this investigation indicate the entire feasibility of satisfactorily treating creamery wastes." "It has been demonstrated that plain sedimentation is a satisfactory tank treatment preliminary to sand filtration, and that . . . a disposal plant may readily be designed for satisfactory treatment of creamery wastes."

On the basis of these experiments brief specifications for a disposal plant are given as follows:

"The settling tank should have a net capacity of about one day's output of the creamery. It should have one or more hopper bottoms with side slopes of 45° and a sludge outlet pipe running nearly to the bottom. The total depth from water line to sludge outlet should be about 12 ft. There should be a vertical bottom baffle extending 3 ft. above the upper edge between each two hoppers, and scum baffles extending 5 ft. into the liquid over the center of each hopper. The entire tank should be covered with a tight board cover. The effluent from the tank should overflow to a siphon chamber having a capacity

of not less than one nor more than six hours' output of waste. This chamber should be provided with an automatic siphon discharging to the filter beds

"The sand filters should have an area of about 725 sq. ft. per 1,000 gal. daily output of waste. . . . The upper layer should be composed of 3 ft. of clean fairly coarse sand, such as would be suitable for concrete. This sand should be laid upon an underdrain system composed of parallel or radiating lines of agricultural draintile, suitably embedded in coarse stone graded upward to fine stone and gravel to exclude the upper sand layer. This filter should be divided into not less than 2 and preferably 4 units, with suitable arrangement for diverting the flow to one or another. The units should be used in rotation."

**Construction and care of fish ponds**, R. C. OSBURN (*Mo. Bul. Ohio Sta., 4 (1919), No. 7, pp. 215–220, figs. 4*).—This article, a contribution from the department of zoology and entomology, Ohio State University, deals primarily with the construction and care of farm fish ponds, with special reference to Ohio conditions.

It is stated that the greatest depth should not be less than 5 or 6 ft., and that there should be an ample area of shallow water around the edge of the pond from 1 to 2 ft. in depth where weeds will grow thickly. This should have some gravelly and sandy areas. The shallow area should be at least half that of the pond. It is stated that in Ohio almost any unpolluted source of water supply will be satisfactory.

The question of stocking with fish is also discussed.

## RURAL ECONOMICS.

**Rural, social, and economic problems of the United States**, C. J. GALPIN and A. B. COX (*Amer. Assoc. Agr. Leg. Bul. 3 (1919), pp. 2+16*).—This is the third of a series of studies published by the American Association for Agricultural Legislation. It consists of a catalogue and summary of about 150 answers to a letter requesting a statement of the chief rural, social, and economic problems sent to a selected list of persons interested in, and acquainted with, agricultural problems.

**The proceedings of the First National Country Life Conference** (*Proc. Nat. Country Life Conf., 1 (1919), pp. 238*).—In this volume are included a summary of conclusions of committees and the following papers on subjects relating to rural problems heard at the conference held at Baltimore, Md., January 6 and 7, 1919: The Work of the Committee on Country Life, by K. L. Butterfield; Home Service of the Red Cross—Its Significance as an Experiment in Rural Social Work, by J. F. Steiner; Community Councils: Their Present Work; Their Future Opportunity, by E. D. Smith; The County Farm Bureau: A New Factor in Rural Life, by A. B. Graham; The Present Crisis and Future Needs of Rural Education, by H. W. Foght; The Present Demand for Improvement in Rural Government and Needed Legislation, by E. C. Branson; Better Organization for Rural Social Service, by H. I. Curry; Realignment of Religious and Moral Forces for Country Life, by W. H. Wilson; The New Appreciation of Play and Recreation in Rural Life, by E. C. Lindeman; The Problem of the Changing Rural Home, by G. L. White; The Enlistment of Trained Leadership, by W. J. Campbell; Investigation and Teaching of Rural Social Problems, by C. J. Galpin; A Cooperative Plan of National Rural Research (E. S. R., 40, p. 890); The Federation of Country Life Forces, by E. L. Morgan; The Social effects of Improved Communication in Rural Life, by J. M. Gillette; and Internationalizing the Country Life Movement, by K. L. Butterfield, et al. In appendixes are a report of the conference on country life interests held at Washington, November 16 and 17, 1917, reprints from

addresses by E. Davenport (E. S. R., 39, p. 703), K. L. Butterfield, and E. D. Sanderson before the American Association of Agricultural Colleges and Experiment Stations, and the report of community council work during the period of demobilization and readjustment and the permanent organization of communities.

**Report of conferences of national organizations engaged in rural social work** (*Rpt. Conf. Nat. Organ. Rural Soc. Work [Nat. Country Life Assoc.], 1919, pp. 16*).—The conferences held at Washington, D. C., March 14 and April 10, 1919, in accordance with a resolution adopted by the conference noted above, outline social needs of rural communities and means of meeting them, with the presupposed economic and political bases, and report a plan of organization for practical application of principles involved.

**First rural life conference of the Rural Welfare League of Texas** (*Bul. Agr. and Mech. Col. Tex., 3. ser., 5 (1918), No. 7, pp. 76*).—Lectures on several phases of rural church problems and land tenure and marketing of farm products are published in the report of this conference.

**Summaries of evidence taken before the Agricultural Policy Subcommittee appointed in August, 1916, to consider and report upon the methods of effecting an increase in the home-grown food supplies, having regard to the need of such increase in the interests of national security** (*Min. Reconstr. [Gt. Brit.], Reconstr. Committee, Agr. Policy Subcommittee, Summaries Evidence, 1918, pp. IV+129, pls. 2*).—Evidence heard in the preparation of the report discussed editorially (E. S. R., 39, p. 402) is here summarized.

**Rural community life in the Haute Marne**, E. G. Bishop (*Studies Sociol [Univ. South. Cal.], 3 (1919), No. 4, pp. 8*).—This gives an account of village life, industries, and methods of agriculture as the author found them in the remote sections of France in 1918.

**Agricultural organizations in Spain**, C. L. Jones (*U. S. Dept. Com., Com. Rpts., No. 154 (1919), pp. 26–34*).—This article reviews briefly efforts to encourage the agriculture of Spain by organization and education. It covers the history and functions of chambers of agriculture, farmers' communities, agricultural syndicates, rural treasuries, and various important unofficial and unique federations. Several flourishing local Catholic agrarian federations and the Association of Spanish Agriculturists are noted.

**The agricultural festival in Moncloa** (*Inform. Agr. [Madrid], 9 (1919), No. 196, pp. 217–220*).—In this report of a congress held under the direction of the Association of Spanish Agriculturists and the National Catholic Agrarian Federation, there are summarized several addresses on the promotion of Spanish agriculture. The recommendations offered by these two organizations relating to legislation, marketing, credit facilities, and cooperation, and by the General Association of Stockmen of the Kingdom regarding production and marketing of live stock and live-stock products are published.

**The twenty-first annual report of the Director of the Swiss Union of Peasants, 1918** (*Pubs. Sec. Paysans Suisses No. 58 (1919), pp. 10–55*).—In these pages of this report are outlined certain projects and investigations of an economic character for alleviating the shortage of agricultural products in Switzerland.

**Report of the committee of Section IV of the Advisory Council on the employment on the land of returned sailors and soldiers** (*Min. Reconstr. [Gt. Brit.], Rpt. Committee Sect. IV Advisory Council, [1918], pp. 39*).—The recommendations of this committee cover questions of housing, the acquisition of land, small holdings, training, wages and employment, the case of disabled men, trade organization, village life, and voluntary effort and private enterprise, often reiterating and supporting those included in the Agricultural Policy

Subcommittee Report (E. S. R., 40, p. 91). There is also included a minority report by R. V. Lennard.

**The soldier colonists**, W. H. WARMAN (*London: Chatto & Windus, 1918. pp. XI+180*).—The introduction to this has been written by the Earl of Selborne, and two chapters included by C. Brooks. Historical instances of group settlement and the early theories of E. G. Wakefield are discussed in approaching the subject, also the principles of organization, psychology, and cooperation upon which systematic migration within the British Empire must be undertaken. On the practical side, the author has included a survey of the offers of overseas dominions of land for settlement, and suggestions for advance and headquarters organization for the project, State representatives, district inspectors, group leaders, and others. He reviews much of the Tennyson Committee's Report in chapters on women and religion and shipping and finance.

**List of references on women in agriculture**, C. R. GREEN (*Spec. Libraries, 10 (1919), No. 5, pp. 138–145*).—This bibliography was prepared by the library of the Massachusetts Agricultural College, the references being classified under the following headings: General, beekeeping, dairying, education, forestry, horticulture, mechanics, poultry, bibliography, fiction, history, and organization.

**[The new laborers' code regulating labor in Germany]** (*Abs. in Mo. Rev., U. S. Labor Statis., 9 (1919), No. 1, pp. 235–237; Internat. Inst. Agr. [Rome], Internat. Rev. Agr. Econ., 10 (1919), No. 4, pp. 237, 238; Jour. Bd. Agr. [London], 26 (1919), No. 4, pp. 453, 454*).—In these publications appear abstracts of the provisions of an ordinance agreed upon by the largest agricultural employment and workers' organization in Germany, and made legal by a decree issued by the people's commissioners and the minister of labor.

**One-third-share farm rent**, A. BECKERICH (*Ann. Sci. Agron., 4. ser., 8 (1919), No. 4–6, pp. 97–106*).—Information taken from early French lease contracts based on this system is cited, and tables showing the marked fluctuations in harvests and prices of grains, etc., through a period of years are given to illustrate the equal fairness of share-rent systems in times of good harvests and bad.

**Farm management**, J. H. ARNOLD (*New York: The Macmillan Co., 1919, pp. [6]+243, pls. 10*).—This is a general discussion of the principles of selection of the farm, management of soil and crops, problems of time, seasons, power, and marketing in their relation to crops, advantages of and profits from live stock, farm organization and business methods, factors in efficiency, and farm administration.

**How to cultivate an agricultural holding**, R. VUIGNER (*Comment Exploiter un Domaine Agricole. Paris: J.-B. Baillière & Sons, 1917, 2. ed., rev. and enl., pp. 640, figs. 4*).—This volume of the Encyclopedia of Agriculture, published under the direction of G. Wery, is a collection of brief treatises based upon the principles of the science and practice of agriculture promulgated in France by the National Institute of Agronomy. The subjects included are soil management, the production of edible and industrial plants, live stock, certain agricultural industries including distilling and wine pressing, sugar refining, and butter and cheese making, laws dealing with holding and cultivation of rural property, and other economic and social phases of agriculture.

**Cooperation for farmers**, L. SMITH-GORDON (*London: Williams & Norgate, 1918, pp. XIV+247*).—The development of cooperation for consumers and agriculturists on the Continent and in Ireland is discussed historically. Difficulties of the system when applied to agriculture, types of consumers' cooperation, producers' societies, and credit societies are discussed, and the progress of the cooperative movement in Denmark, Ireland, and the United States, the

attitude of the various governments toward it, and the future of the movement are described in detail.

**Cooperation in the new world**, L. SMITH-GORDON (*Better Business, 4 (1919), Nos. 2, pp. 81–97; 4, 249–255*).—The first of these articles gives an account of the peoples' banks of Quebec, credit unions of Massachusetts, the remedial loan associations under management of the Russell Sage Foundation, the Jewish credit societies, and credit unions of North Carolina. The second is a summary of the series of articles reporting the author's visits to farmers' cooperative societies in America (E. S. R., 40, p. 591). His final comment is that American cooperation has been largely built up upon the agricultural supply business and the marketing of produce, in which latter sphere there is an advance over anything in other countries and that the chief criticism of the movement as a whole in the United States is its weakness in regard to federation. He points out also that a wide field exists for international cooperative action.

**The cooperative marketing of live stock** (*Agr. Gaz. Canada, 6 (1919), No. 7, pp. 635–646, figs. 4*).—Brief reports of the work in Nova Scotia, Quebec, Ontario, Saskatchewan, and Western Canada are given to show the progress of this form of farmers' cooperation.

**The cooperative societies for bringing land under cultivation**, M. L. TARDY (*Compt. Rend. Acad. Agr. France, 15 (1919), No. 2, pp. 79–92; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Agr. Econ., 10 (1919), No. 1–2, pp. 30–35; Scot. Jour. Agr., 2 (1919), No. 3, pp. 422, 423*).—This reports the author's inquiry into the work of cooperative cultivating societies in various districts of France in increasing agricultural production and bringing about certain social and economic reconstruction.

**Municipal markets in cities having a population of over 30,000, 1918** (*Washington: Bureau of the Census, 1919, pp. 56*).—Data are presented in general tables and in the text relating to them showing organization, classes of employees, areas and buildings, rentals and methods of operation of markets, and regulations and various laws concerning public markets, together with the revenues, costs, and valuations of this enterprise at the close of the year 1918.

**Geographical phases of farm prices: Oats**, L. B. ZAPOLEON (*U. S. Dept. Agr. Bul. 755 (1919), pp. 28, pls. 2, fig. 1*).—This study of farm prices of oats is similar in plan to one relating to corn, previously noted (E. S. R., 39, p. 895). Price maps showing sectional differences in farmers' prices of oats, based on averages by counties for the five years, 1910–1914, and the relative importance of different parts of the United States in the production of oats according to the census of 1909 are given; also statistics for the disposition of the crops, farm consumption, commercial movement, influence on price of trade routes and commercial centers, a retrospective view of farm prices of oats, 1871–1915, local price factors, trends of yields, values to the acre, geographical differences in prices, cost of production, and miscellaneous data.

**The sugar question and the resupplying of France during the period 1914–1917**, H. REMY (*La Question des Sucres et le Ravitaillement de la France pendant la Période 1914 à 1917. Paris: Libr. Soc. Rec. Sirey, 1917, pp. 172*).—This is a study of production and prices of beet and cane sugar. It reviews the movement of sugar upon the world market and the production and consumption of this commodity in France between 1841 and the years immediately preceding the outbreak of the war. A detailed account is given of State intervention and the various means adopted to secure a supply in France and the foreign countries. In this connection information relating to conditions in Germany is taken from an Abstract of German Economic Legislation During the Present War by T. Reinach.

[Agriculture in Alaska] (In *Alaska, "Our Frontier Wonderland," 1919. Seattle, Wash.: Alaska Bur., Seattle Chamber Com. and Com. Club, 1919, 7 ed., rev., pp. 73–90, figs. 12*).—This section of this pamphlet describes the grain crops and grasses, vegetables, wild and cultivated fruits, wild flowers, forests, and live stock in Alaska and offers information and suggestions to homesteaders.

Statistical report of the California State Board of Agriculture for the year 1918 (*Statis. Rpt. Cal. Bd. Agr., 1918, pp. XXII+477, pls. 14*).—Detailed statistics relating to population, public lands, fruits, farm crops, live stock, irrigation projects, and the value of crops and lands are continued for 1918.

Agricultural statistics of Canada (*Canada Census Indus., 1917, pt. 1, pp. XIV+47+XIII, figs. 4*).—In these tables are assembled the actual agricultural statistics collected in four agricultural Provinces, and the annual estimate for the Dominion as a whole, relating to field crops, prices of agricultural products, wages of farm help, farm live stock, and agricultural exports and imports, together with comparative figures for previous years and data selected from agricultural statistics of other countries.

[Field crop and live stock report of Canada for 1917], J. H. Grisdale (*Canada Expt. Farms Rpt. 1918, pp. 5–7*).—Data previously noted (E. S. R., 40, p. 792) are continued. According to this report the total value of Canada's field crops for the year was $1,144,636,456, an increase of more than a quarter of a million dollars over the figures for 1916.

Summary of the present condition of agriculture in Chile, F. R. Huneeus (*Reseña Sumaria del Estado Actual de la Agricultura en Chile. Santiago de Chile: Min. Indus. y Obras Pub., Dir. Gen. Serv. Agr., 1919, pp. 48, pl. 1*).—The character of the country is described by regions, and information relating to areas sown to different crops, fertilizer resources, extent of irrigation, use of agricultural machinery, notes on the cultivation and yield of each of the principal crops, the number and classes of live stock, etc., are given.

[Agricultural statistics of Chile] (*Statis. Abs. Chile, 1918, pp. 76–91*).—Data previously noted (E. S. R., 38, p. 495) are continued for the year 1917.

[Agricultural statistics of Colombia] (*An Estadis. [Colombia], 1915, pp. 121–176*).—These pages show the acreage, production, and value of the principal crops for the year 1915 by departments with summaries, also the number and classes of animals.

General abstracts showing the acreage under crops and the numbers and descriptions of live stock in each county and province, 1916–1918 (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1918, pp. 37*).—Information previously noted (E. S. R., 34, p. 291) is continued for 1916, 1917, and 1918.

Acreage and live stock returns of Scotland, with a summary for the United Kingdom (*Agr. Statis. Scotland, 6 (1917), pt. 1, pp. 53*).—This annual report continues information previously noted (E. S. R., 40, p. 194).

[Agriculture in Norway] (*Statis. Aarbok Konger. Norge, 38 (1918), pp. 25–37*).—These pages continue data under the same plan as previously (E. S. R., 39, p. 896).

[Agriculture and live stock in Sweden] (*Sveriges Off. Statis., Jordbr. och Boskapsskötsel, 1915, pp. VIII+157*).—This annual report continues information previously noted for 1914 (E S. R., 37, p. 191).

Finland's farms and farm life, T. Haynes (*U. S. Dept. Com., Com. Rpts., No. 167 (1919), pp. 378–383*).—The author reviews briefly some primitive aspects of farm life in Finland, matters of land holding, private initiative and Government aid, and the establishment of agricultural schools, etc., and gives some statistics for the crops of recent years and the development of the butter-making industry.

**Area, classification of area, area under crops, live stock, land revenue assessment, and transfers of land in British India [and in certain native States]**, G. F. SHIRRAS (*Agr. Statis. India, 33 (1916–17), I, pp. XVI+321, pls. 6; II, pp. IX+116, pl. 1*).—The first volume of this report continues statistics previously noted (E. S. R., 39, p. 896), with some additional maps and charts relating to cropped areas, rainfall, etc. The second volume continues other statistical information (E. S. R., 40, p. 793).

## AGRICULTURAL EDUCATION.

**Proceedings of the thirty-second annual convention of the Association of American Agricultural Colleges and Experiment Stations, 1919**, edited by J. L. HILLS (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas., 32 (1919), pp. 272*).—These proceedings have been previously noted (E. S. R., 39, p. 701).

**First and second annual reports of the Department of Vocational Education, 1917–1919**, I. COLODNY (*Bul. State Bd. Control Vocat. Ed. [Ariz.], No. 4, (1919), pp. 19*).—According to this report three high schools and one normal school qualified and participated in Smith-Hughes funds for instruction in agriculture in 1917–18. Of the 30 high schools in the State, only 5 made any effort to teach agriculture. The total number of pupils attending Smith-Hughes classes in agriculture was 112, or only about 20 per cent of the boys attending high schools in strictly agricultural communities.

Approval was given to 5 day schools in home economics. The number of students enrolled in Smith-Hughes classes in home economics was 215 out of a total enrollment of 2,096 in schools approved for home economics.

The University of Arizona enrolled teacher-training classes in the home economics department in 1917–18 and 1918–19, but no students in agriculture.

In 1918–19 seven schools qualified in agricultural instruction under the Smith-Hughes Act, with an enrollment of 129. Two conferences of agricultural teachers were held, at which home-project work and the distinctive features of vocational agriculture were discussed. Five high schools with an enrollment of 128 pupils were subsidized for home-economics instruction. An opportunity school was organized April 5, 1919, by the Department of Vocational Education, in conjunction with the city schools of Phoenix. The most satisfactory work in home economics was done in the evening schools.

**Regulations and suggestions concerning county agricultural high schools of Mississippi** (*State Bd. Ed. Miss. Bul. 12 (1919), pp. 54*).—This publication contains an outline of the course of study of the Mississippi county agricultural high schools, and of the regulations which become effective in the 1919–20 school session; a list of adopted textbooks; questions and answers relating to the establishment and administration of these schools; agricultural high school laws in Mississippi; and suggestions concerning the course of study in home economics to meet the need of a more uniform and better standard of work in the schools.

It is suggested that three units of home economics, given in either a 3 or 4 year course, be the minimum for graduation. The minimum time required for the ordinary high school unit, viz, five 40-minute recitations a week for 32 weeks, is acceptable, but it is urged that five 45-minute recitations for 36 weeks be adopted. The consensus of opinion seems to be that the strongest arguments are in favor of putting home economics instruction in the first, second, and fourth year of the agricultural high school course. An outline is given of the suggested course.

**Agricultural education**, H. W. POTTS (*Richmond, N. S. Wales: Hawkesbury Agr. Col., [1918], pp. 8*).—The author describes the facilities for agricultural

instruction at the Hawkesbury Agricultural College, Richmond, New South Wales. He states that the total number of students who have passed through the college since its inception, and who have pursued a course of training in farming and live stock, is 2,037. At least 78 per cent of these are putting their training into practice on the land or occupying responsible positions associated with rural pursuits. A total of 621 rural teachers have taken the summer course in nature study, elementary agriculture, school gardening, etc., and 2,180 pupils and 180 teachers have attended the rural camp schools, held under the direction of the department of public instruction with the object, especially, of interesting children in country occupations. In the 12 years since its establishment in 1905, the farmers' winter school has been attended by a total of 1,055 practical farmers.

**Itinerant instruction**, B. CARQUEJA (*Bol. Sec. Estado Agr.* [*Portugal*], *1* (*1918*), *No. 2–4, pp. 95–101*).—A brief account is given of the development of movable schools of agriculture in Portugal since the organization of the first school of this kind in 1901.

**The present status of itinerant instruction in Algarve**, M. PAIS DA CUNHA FORTES (*Bol. Sec. Estado Agr.* [*Portugal*], *1* (*1918*), *No. 1, pp. 5–21*).—This is an account of the present status and some results of the work of the movable schools of agriculture in the province of Algarve, Portugal, with brief notes on such schools in other countries.

**Movable schools of agriculture organized by the Journal of Commerce of Porto** (*Bol. Sec. Estado Agr.* [*Portugal*], *1* (*1918*), *No. 2–4, pp. 102–111*).—The aims, organization, and course of instruction by months, of movable schools of agriculture in Portugal are outlined.

**Training of discharged soldiers and sailors** (*Scot. Jour. Agr., 1* (*1918*), *No. 3, pp. 346–349*).—Brief outlines are given of various schemes, prepared and put into operation by the Board of Agriculture for Scotland in conjunction with the Ministry of Pensions, for the training of discharged soldiers and sailors in forestry, gardening, and agriculture.

**Training in farm and garden work in reformatory and industrial schools**, J. O. PEET (*London: Bd. Ed.* [*Gt. Brit.*], *1919, pp. 16*).—This report gives some account of the systems of land management and the methods of training boys in agriculture and horticulture practiced at the 12 reformatory and industrial farm schools in Great Britain visited by the Chief Inspector of Reformatory and Industrial Schools of the Board of Education, and presents some general conclusions with regard to the needs and development of the work of the schools. Attention is called especially to the importance of regarding institutions possessing farms as places of training for future land workers, rather than as places of detention to be made as far as possible self-supporting; the need of more and better qualified instructors and of improved equipment, closer coordination between the school work and the practical work and the development of theoretical instruction concurrently with the instruction in the field or the garden, the preparation of properly graded schemes of training in agriculture and horticulture, differentiation in the training of the future market gardener and of the farm workers, provision of more advanced courses for reformatory schools than for industrial schools, and possibly courses of an entirely different type; the desirability of providing classes in gardening for all boys in the institution, and of introducing skilled instruction in bee and poultry keeping and more varied courses in handwork; and a considerable modification or the total abandonment of the practice of hiring out boys to farmers in the vicinity for day work.

**Agriculture at the primary school**, L. ROUGIER, C. PERRET, and A. MIAILLE (*L'Agriculture à l'Ecole Primaire. Paris: J. B. Baillière & Sons, 1914. 3. ed.,*

*pp. 252, figs. 236*).—This book includes outlines of 27 lessons in plant production, 5 lessons in animal production, and 1 each in rural economy and the friends and enemies of the farmer. Each lesson is followed by review questions, problems, and references to the literature.

**How to teach agriculture in the primary school**, C. PERRET (*Comment Enseigner l'Agriculture à l'École Primaire. Paris: J. B. Baillière & Sons, 1910, pp. 96, figs. 33*).—The author states the object and method to be employed in agricultural instruction in the primary school, including suggestions for the establishment of a school museum, class experiments, and different ways of demonstrating plant growth, viz, in pots, in water, in the school garden, in the school yard, in demonstration plats, in experiment fields, and in different kinds of soils.

**The Allerey Handbook** (*Beaune, France: Amer. E. F. Univ., 1919, pp. [IV]+263*).—This book outlines 14 courses in agriculture prepared by the instructors of the American E. F. University Farm School at Allerey, Saone-et-Loire, France (E. S. R., 41, p. 106), and given in the school. The subjects dealt with are buildings and equipment; field crops, manure and fertilizers, and soils; dairying, types and breeds, feeding and management; poultry; fruit growing; vegetable gardening; agricultural geography, rural sociology, marketing and cooperation, and farm management.

**Horticulture**, K. C. DAVIS (*Philadelphia: J. B. Lippincott Co., 1919, pp. VII+416, pl. 1, figs. 287*).—This textbook for high and normal schools deals with plant propagation and breeding, gardening, orcharding, small fruit growing, forestry, beautifying home grounds, and the soils and enemies involved. To aid in making the teaching as concrete as possible, numerous suggestions for questionnaires, surveys, local investigations, practicums, field and laboratory exercises, field trips, home projects, etc., are included at the close of the chapters, together with review questions and references to literature. An appendix contains a brief list of horticultural works for school libraries, and useful data with reference to suitable distances and varieties for planting, losses in crop removals, sources of plant food, etc.

**Mainly the pedagogy of seeds with some seeds of pedagogy**, W. G. VINAL (*Nature-Study Rev., 15 (1919), No. 6, pp. 213–232, figs. 2*).—Suggestions are offered for making educational measurements with seeds, and on methods of teaching seed germination and dispersal, mounting seeds for class use, and studying seed folk lore, omens, and charms.

**Outlines of course of instruction in agricultural nature study for the rural schools of California**, O. J. KERN (*California Sta. [Pub.], 1919, pp. 55, figs. 60*).—The material outlined in this publication is grouped under four general topics, viz, human needs, interests, and activities; plant and animal life, respectively, throughout the year; and natural phenomena and the inorganic world and soil studies. The matter represents part 3 of the syllabi worked out by the author in his course of instruction on the elements of agricultural nature study and school and home gardening, given in the University of California. Parts 1 and 2 have been previously noted (E. S. R., 41, p. 95).

**Some considerations in teaching a bird course**, J. M. SHAVER (*Nature-Study Rev., 15 (1919), No. 2, pp. 53–57*).—The author outlines a scheme for field work with birds, and offers suggestions for laboratory work.

**Our southern birds**, E. B. MILES (*Chicago: National Book Co., 1919, pp. 174, pl. 1, figs. 89*).—This is a nature study book on southern birds for the non-scientific student.

**Productive poultry husbandry**, H. R. LEWIS (*Philadelphia and London: J. B. Lippincott Co., 1913, 3. ed., rev. and enl., pp. XXII+574, pl. 1, figs. 237*).—Chapters on business management, and judging and culling fowls for egg pro-

duction have been added to this new edition of this text, which has been previously noted (E. S. R., 31, p. 270).

**Civic biology**, C. F. HODGE and J. DAWSON (*Boston and London: Ginn & Co., 1918, pp. X+381, pls. 4, figs. 168*).—This text is devoted to a solution of local and national problems by civic cooperation in the conservation of natural resources and the extermination of animal and insect pests and disease germs. Instructions are given, by means of type problems, for the study of insects, birds, trees, plants, rodents, fungi, bacteria, fish, etc., for cultivating habits of observation, insight into the workings of living nature, civic ways of thinking, and civic methods of studying and attacking such problems. Chapters are included on equipment, apparatus, and the library; the practical laws of life; how to use national organizations for biological instruction and research; and progress in biological discovery.

## MISCELLANEOUS.

**Annual Report of Florida Station, 1918** (*Florida Sta. Rpt. 1918, pp. 93+VI, figs. 16*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1918, a list of the publications of the year, a general review of the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

**Report of the Canada Experiment Farms, 1918** (*Canada Expt. Farms Rpt. 1918, pp. 148*).—This contains the reports of the director, the Dominion specialists, and the superintendents of the various substations. In addition to experimental work abstracted elsewhere in this issue, meteorological data and minor feeding trials with steers, dairy cattle, horses, sheep, pigs, and poultry are included.

**Quarterly bulletin of the Michigan Experiment Station** (*Michigan Sta. Quart. Bul., 2 (1919), No. 1, pp. 56, figs. 19*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: The College Guernsey Herd, and Suggestions for Feeding Cows on Seven Day Tests, both by J. E. Burnett; Selecting Gilts, by G. A. Brown; Self-feeders Reduce Pork Production Costs, by W. E. J. Edwards; Some Remarks About the Diagnosis and Treatment of Infectious Abortion, by H. J. Stafseth; Some Canning Practices From the Bacteriologists Standpoint, and Start Your Vinegar Right, both by Z. Northrup; Legume Innoculation, by R. M. Snyder; Botanical Notes, and Bordeaux Mixture, both by G. H. Coons; Fertilizers for Fall Delivery 1919, by A. J. Patten; Coccidiosis, by W. L. Chandler; The Clover Seed Situation, and Increasing Returns Per Acre From Wheat and Rye, both by J. F. Cox; How May Soldier Farmers Determine Between Soils Fit for Agriculture and Those Suitable for Forestry, by F. H. Sanford; Orchard Cover Crops, by I. T. Pickford; Preparing Fruits for Market, by J. Carmody; Loss of Moisture During Incubation, by C. H. Burgess; Fall Plowing, by C. H. Spurway; Tuberculosis in Chickens, and Hard Milking Cows, both by E. T. Hallman; and Rodent Control—The Field Mouse, by A. C. Conger.

**Monthly Bulletin of the Ohio Experiment Station** (*Mo. Bul. Ohio Sta., 4 (1919), Nos. 6, pp. 169–199, figs. 19; 7, pp. 201–231, figs. 13*).—These numbers contain, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following:

No. 6.—Brief notes on Tomato Diseases, by W. Van Pelt, and Lessons from the Southeastern Test Farm, by C. W. Montgomery.

No. 7.—Information on the Ohio Experiment Station Dairy Herd, including herd records.

# NOTES.

**Alabama Canebrake Station.**—The station has leased for five years a tract of 240 acres of adjoining land, which it is planned to put into alfalfa as soon as possible. More work with hogs and dairy cattle is also contemplated.

**Illinois University and Station.**—Dr. Cyril G. Hopkins, professor of agronomy, chief agronomist and chemist, and vice director of the station, died at Gibraltar, October 6. He was returning to his country from a year's study of means of restoring the exhausted soils of Greece, where his work and recommendations are said to have made a profound impression. He had completed his report, and had been decorated by the King in grateful recognition of his services.

Dr. Hopkins was born in Minnesota July 22, 1866, and graduated from the South Dakota College in 1890. He received the M. S. and Ph. D. degrees from Cornell University in 1894 and 1898, respectively, and had also studied at Goettingen University. After short periods of service as assistant chemist in South Dakota and New York, he went to the Illinois Station in 1894 as chemist. He was made professor of agronomy in 1900 and vice director of the station in 1903.

Dr. Hopkins' death marks the passing of an outstanding constructive force in the application of science to the betterment of agricultural practice. He translated the results of scientific investigation into terms of agricultural practice, and taught that permanent agriculture is the foundation of national welfare with convincing power and profound and far-reaching effect. He rendered an invaluable service in awakening the farmers of the Middle West and elsewhere to the danger of continued overdraft on soil fertility. He looked upon the soil as a legacy which, after supplying our present needs, should be transmitted unimpaired, if not enhanced, in fertility and productiveness. To this end he taught that the farmer should take frequent inventory of the soil constituents and see to it that no one of these runs short of the amount required for maximum crops. He maintained that every farmer should be able to answer affirmatively the question—Am I returning to the soil as much phosphorus or potassium as my crops remove, and am I abstracting from the atmosphere by my rotations enough nitrogen to restore the draft upon the land?

The essential features of the system which he advocated for permanently restoring and maintaining the fertility of ordinary Illinois soils were the full use of the manure produced on the farm, the return of crop residues to the land, the growing of leguminous crops in the rotation with sufficient frequency to maintain the nitrogen supply of the soil, and the application of ground limestone and raw rock phosphate. The direct application of potash was not recommended except in special cases because in his judgment most Illinois soils contain sufficient potash to supply maximum crops for many years.

Dr. Hopkins was a fellow of the American Association for the Advancement of Science and the recipient of other honors. He was the author of many bulletins and articles, as well as several books, the most important of which is Soil Fertility and Permanent Agriculture, published in 1910.

**Minnesota University and Station.**—The total enrollment in the university is over 7,000, with about 650 in the college of agriculture, forestry, and home economics. The school of agriculture has registered fully 700, as compared with 250 a year ago.

Plans have been approved for a superintendent's cottage and small live stock barn at the Waseca substation. A tract of 8 acres at the fruit station at Zumbra Heights has been purchased, and negotiations are under way for a larger tract.

C. P. Bull, professor of agronomy and seed specialist, resigned October 1 to engage in the seed business. J. C. Cort, associate professor of dairy husbandry, has resigned to become manager of a large dairy farm in Wisconsin, and has been succeeded by Allan B. Rayburn as assistant professor of dairy husbandry. Other resignations include A. G. Tolaas as extension specialist in plant pathology to become chief inspector for the newly organized State board of inspection and certification of seed potatoes; Elizabeth Vermilye as assistant professor of home management; R. O. Westley as assistant professor of agronomy at Crookston; and E. S. Proebsting and J. W. Bushnell as instructors in horticulture.

W. H. Alderman, professor of horticulture and horticulturist of the West Virginia University and Station, has been appointed chief of the division of horticulture beginning September 1. Among other appointments may be noted those of George A. Pond as assistant professor of agronomy and farm management; Theodore E. Odland as instructor in agronomy; T. S. Hanson as assistant in forestry; J. E. Chapman as assistant in soils; Harold Macey as assistant in dairy bacteriology; Harold Borst as assistant seed analyst; J. H. Beaumont as assistant in horticulture; E. O. Hanson as assistant in dairy husbandry; Robert R. Smith as agronomist at Crookston; Frank Frolik as extension specialist in plant pathology; Alberta Gustafson as assistant State leader of boys and girls club work; Julia O. Newton as assistant State leader of home economics extension work; Norris K. Carnes as instructor in animal husbandry; Grover C. Matthews as assistant professor of beekeeping; Clyde R. Chambers as research assistant in agricultural economics; Edward C. Torrey as extension specialist in publicity work; and Adele Koch as extension specialist in home economics.

**Pennsylvania Institute of Animal Nutrition.**—Charles D. Jeffries and W. J. Sweeney, 1919 graduates of the Pennsylvania and Massachusetts Colleges, respectively, have been appointed assistants in animal nutrition beginning September 1.

**Canadian Agricultural Appointments.**—Dr. Simon Frasie Tolmie, member of Parliament for Victoria, B. C., has been appointed Canadian Minister of Agriculture. He is a graduate of the Ontario Veterinary College, and was for many years a Federal and Provincial veterinary inspector, as well as a live stock raiser and president of several live stock organizations.

Dr. J. H. Grisdale, director of the Canadian Experimental Farms and acting deputy minister of agriculture, has been appointed deputy minister of agriculture. E. S. Archibald, Dominion animal husbandman, has been appointed director of experimental farms.

F. M. Clement has been appointed dean of the faculty of agriculture at the University of British Columbia, vice L. S. Klinck, who has been appointed president of the university.

**Agricultural Bequest to Wilmington, Vt.**—By the will of the late Clinton C. Haynes, his entire estate, estimated at $20,000 or more, has been left to the people of Wilmington, Vt., in trust "for the benefit of agriculture in said town." The will provides for the investment of the fund, the income to be used as the trustee deems most advantageous to the agricultural interests of the people of the town, but being annually applied for the expense of lectures, experiments, premiums, and other purposes incident to the object for which the fund was created.

EXPERIMENT STATION RECORD.

VOL. 41. NOVEMBER, 1919. No. 7.

The question of the name, the composition, the organization and authority of the Association of American Agricultural Colleges and Experiment Stations has been a fruitful one for discussion from time to time. At intervals considerable attention has been given to these matters. Changes have been made in the constitution as the need for them became evident, and as new features of the college work came into prominence they have been brought within the purview of this organization. Meanwhile the association has gone on for thirty-three years steadily growing in strength, influence, and usefulness, and been a large factor in the unfolding and development of the program of the land-grant colleges. Its meetings have been a great clearing house for ideas and plans relating to the whole field and function, means and ends, of this great group of institutions.

The association has been in many ways a unique organization. Administrative officers and their subordinates, heads of the different branches and experts, have counseled together freely, been stimulated and restrained, given broader vision tempered by sound judgment and expediency. Every deserving cause or proposal has been assured a hearing. It has been a singularly free and democratic organization, representative of the spirit of these public institutions and the novel character of their undertaking. There can hardly be doubt that these things have helped to make the institutions what they have been—steadily progressive without radicalism. The association has formed a vital part of the National system in this period of evolution and development.

The Chicago convention marked a change in this body which affects the name, the representation, and the internal organization, and places matters of policy and legislation more definitely in the hands of the college executives. Under the new or largely revised constitution which was adopted, the Association of Land-Grant Colleges becomes a body composed exclusively of these institutions represented by their presidents. The only exception is the experiment stations receiving the benefits of the Hatch Act but existing separate from the colleges. These heads of the institutions constitute the "executive body," which is charged with all legislative matters relating to the association. There is provision for a series

of sections open to delegates from the respective branches or main divisions of the colleges, but the latter are without membership in the association proper and their representatives will have voice only in their sections.

As pointed out in the meeting last year, the change is a reorganizing one rather than one involving any revolutionary principle, since in theory at least no action affecting the policy of the association has been binding in the past without ratification by the section on college work and administration, composed of the presidents of colleges and universities or accredited representatives. The working out of the "unitary character" of the organization is the chief change involved, and, as was explained last year, it is designed to relieve the complexity of the body and definitely centralize authority in the hands of those primarily responsible. Whether or not the end then emphasized has been accomplished, of enabling the executives to know what the sections are thinking about, "to hear what their subordinates are saying, to understand their difficulties," will remain to be determined.

Under the new constitution three main departmental sections are recognized, namely, agriculture, home economics, and engineering; but by common consent subsections for experiment station and agricultural extension work were provided under the section of agriculture, and officers for them were appointed. There will still be opportunity, therefore, for discussion of matters of special interest to these branches, which have been so profitable in the past and are still felt to be needed; and the standing committees of the association from which annual reports have been expected are all retained. The executive committee is to include two members selected at large, and for the coming year these positions are filled by the deans of two of the leading agricultural colleges who are likewise directors of the stations.

While details under the new organization remain to be worked out, the body remains essentially what it has been in the past, an organization in which the various branches of the land-grant colleges find representation; and in the actual workings of the association the changes may not be especially noticeable in most respects.

The new officers elected for the coming year include Chancellor Samuel Avery, of Nebraska, as president, Dr. R. J. Aley, of Maine, as vice president, Dean J. L. Hills, of Vermont, as secretary-treasurer, and two new members on the executive committee, namely Dr. W. E. Stone, of Indiana, and Dean A. R. Mann, of New York. These latter replace President W. O. Thompson and Dr. W. H. Jordan who declined reelection and announced their intention to retire from their present positions during the coming year. Both of these men have rendered long and conspicuous service in the association and on its executive committee. They will be greatly missed from

future conventions, and their going will be a loss second only to that experienced by the institutions over which they preside. Expressions of deep regret and of grateful appreciation were embodied in resolutions passed by the association.

The Chicago convention was one of the most interesting and successful ones held in many years. The attendance was large and was widely representative of the country as a whole and of the interests comprised in the association. The program was a broad one, including not only the reports of various officers and committees, but several notable addresses by special speakers and invited guests.

Among the latter were the Secretary of Agriculture, who presented a broad survey of present agricultural conditions and tendencies, and some of the problems which call for studious attention; Col. F. J. Morrow, who spoke upon military education as related to the land-grant colleges; Dr. James R. Angell, president of the National Research Council, who discussed the present scope and organization of research in this country, means for stimulating and promoting it, and the purpose of the research council; and Mr. C. R. Titlow, of Baltimore, who described the Federal system of financing the farmer.

The address of the president of the association, Dr. C. A. Lory, dealt with an institutional program for State development, in which was outlined the larger field of the land-grant colleges and the part they should play in State development, especially in reference to education. Dr. Lory argued for rural school improvement as a part of country life betterment, and held that a better agriculture can not be had without better country schools. The colleges should interest themselves in this endeavor and provide for cooperation and council with the local authorities. Stress was laid upon giving more attention to the human side of agriculture, including in the program rural economics and rural sociology, with both teaching and research.

The training of teachers was held to be an important function of the colleges, in which the provisions of the Nelson Amendment are not being fully measured up to. Development of the engineering branch of the colleges similar to that which has taken place in agriculture was advocated, getting away from the narrow professional view to that of State service, giving attention to the man in industry and his needs as well as to the technical phases. In this connection the need of engineering experiment stations was again pointed out.

In planning for the systematic study and outlining of a State-wide program of development, an advisory council was recommended, and a State development commission was suggested to carry forward consistent plans.

President Kenyon L. Butterfield described the organization and conduct of the educational work carried on among the American Ex-

peditionary Forces over-seas, the various forms which the work took, the interest and success attending it, and some of its outgrowths. The association expressed by resolution its appreciation of the services in this work of President Butterfield and his associates.

In an interesting and significant paper Dr. W. H. Jordan discussed institutional ethics, setting forth the moral responsibilities of the institutions to the supporting public, to one another, and to their staffs. Under the first head he pointed out that the obligation in respect to teaching is that the scientific and technical instruction be sound. This requires that teachers have abundant time for study. In popular teaching a constructive attitude is called for in order to avoid error. In station work the need of conservatism in publishing results was pointed out, together with the danger of selecting problems having a popular slant. The obligations under the Hatch and Adams Acts will only be met, he said, by severe study of fundamental character.

As between institutions, the drawing of men from one to another was declared to be both inconsiderate and unethical. The station work is subject to more serious damage from this cause than that of any other branch of the college. Such change often means disaster to the work and loss of funds. Conference and mutual agreement between the institutions concerned was advocated, to determine the time when a change may reasonably and conveniently be made. Between institutions and members of their staffs it was held that there should be an understanding at the time of employment which will protect the work. This would guard against a teacher going elsewhere before his work with classes is completed or an investigator abandoning his projects.

The bibliographer's report, presented by Dr. A. C. True, dealt with the effect of the war on the course of agricultural and scientific periodical literature in the more important European countries. It was shown that not only were many important serial publications interrupted or discontinued, or failed of their usual distribution, but that to considerable extent track was lost of what was actually published in that period. There is still lack of authoritative information concerning the present status of many of these serial publications, and hence the impressions presented were of unusual interest.

As no provision was made under the new constitution for continuing the office of bibliographer, this will be the final report of a series which in the past quarter century has covered a quite wide field.

Throughout the various meetings of the convention research may be said to have been the key note. It seemed to have assumed unusual importance in the minds of speakers and of members generally. Interest in it was not confined to the station section, but was evident

in the program of the general sessions and in the college and extension sections. Various speakers pointed to its present needs, urged that it be generously fostered as the main basis of agricultural growth, and pleaded for the development of wider appreciation and understanding of it.

The subject was introduced at the opening session of the convention in the address of the Secretary of Agriculture, who, in emphasizing the value of the land-grant colleges to our democracy, pointed out that recent events have made it singularly clear that "agricultural institutions must omit no step to add, through research and experiment, to the sum of our scientific knowledge." He referred to the inadequacies of information on important topics, in some instances there being no results on which to base intelligent conclusions. Up to a few years ago investigation had seemed to run ahead of facilities for conveying information, but now "the danger is rather that our teaching may outrun the accumulated stock of knowledge and become sterile."

The Secretary made a strong argument for a well balanced program of both instruction and research throughout the Nation. "To this end it must secure and retain the services of its most talented scientific and practical men; and this means something in terms of dollars and cents. It means that we must not only place the investigator on a higher financial plane but also give those who have talent funds and facilities in generous measure." It is increasingly clear, he said, that in all positions of responsibility the State and the Nation must be prepared to secure and retain men of the requisite training and experience, and to make the conditions sufficiently attractive. "Our democracy is today threatened with inefficient service because of its failure to provide a reasonably decent compensation for men of capacity charged with large responsibilities, and our democratic arrangements may either break down or result in commonplace performance, if reasonable requirements are not met."

The National obligation for scientific research as the reproductive process of science was emphasized in the paper of Dr. Angell, which pointed to the unprecedented illustrations of the value of research developed by the war. The National Research Council aims at the permanent mobilization of the scientific agencies, an end which European countries have attempted to accomplish by subsidy.

Surveying the principal research agencies of the Nation, attention was called to the experiment stations as a class offering exceptional opportunities for systematic inquiry, but handicapped at present by conditions and circumstances which limit their highest attainment. Reference was made to the extent to which the stations are often burdened with routine and quite elementary work at the expense of research, the lack of coordination between stations and

within their organizations, and the unusually favorable conditions for developing cooperation.

From a review of conditions surrounding the various classes of research agencies, Dr. Angell declared that the Nation must be aroused to all that the situation implies; salaries must be increased, the number of workers must be increased, and there must be a larger appreciation of what research means to society.

Attention was frankly called to the present position and outlook of the experiment stations in the report of the committee on station organization and policy, based on a special study of them. This showed that the stations have been largely neglected of late, have received practically no increase in funds since prior to the war, and have had to contend with the same adverse conditions as other branches in increased expense, loss of workers, shortage of supplies, and shifting of attention. Hence they are in a relatively weakened condition, out of harmony with their importance to other branches of the college work and to the community. While other lines, like agricultural extension, which are dependent upon continued investigation have grown enormously, the stations have practically stood still, and in not a few cases have lost ground through inability to meet changing costs and the larger competition for men of scientific training.

This being the case, the agricultural system is clearly in danger of getting out of balance, if it has not already become so, and the need of larger administrative attention and increased financial provision are clearly indicated. The gravity of the situation was shown in the measure and extent to which the station work has been retarded in scope, continuity, and ability to meet new needs. In very many instances it has been necessary to suspend or restrict operations on investigations under way, or to omit taking up new ones for which there is demand. At all but ten stations, most of which have liberal State support, numerous standing projects have had to be suspended or materially reduced in scope and it has become impossible to take up others of importance because of lack of funds or workers. In many cases lines of work are being sacrificed in order not to sacrifice quality. Even those stations which have not thus far felt the pinch so severely admit their inability to do their duty toward new problems.

The loss of men from the stations, many of them in responsible positions, has been a great hindrance to progress. This is due in no small part to inability to pay adequate salaries, and is often complicated by an established salary scale for the entire institution or a particular branch of it. In the opinion of the large majority of directors, the salary scale of investigators falls far short of adequately reflecting the special qualifications, ability, and long training which

are required for success in that field. Several declare that the present salaries are no longer adequate for retaining men capable of carrying on high grade research, or attracting the best type of men to it. Comparison shows that the entrance salary and the prospects of advance are more attractive in extension than in research, and that the maximum to which workers may ultimately look forward is practically the same in the two lines.

The effect of these conditions is to discourage promising students from undergoing the special training to prepare themselves for research, and the testimony is that relatively few are looking to that field. The feeling is abroad that the inducements for a research career are relatively less attractive than five years ago, and are growing less so from the standpoint of young students. Little apparently is being done by the colleges to counteract this condition, which indicates that severe as the situation has become, the chief cause of alarm lies in the future. The committee warned that "until institutions frankly acknowledge the high quality of research as placing it at the pinnacle of scientific effort in agriculture, and express this in the salary that may be attained irrespective of any general scale, it is quite evident that the supply of persons trained for station work as a career will not be sufficient to meet its requirements and allay constant apprehension for the future."

The committee made two suggestions bearing on this matter. It advocated a larger provision of scholarships or research fellowships to make the approach more favorable for students desiring to prepare for agricultural research. These would afford an incentive and an opportunity which are now often closed to such students of promise, and would thus aid in building up the supply of men of rigid training and broad vision such as the stations require. And to enlarge the outlook in that field and recognize its relative high standing, it was suggested that the colleges establish a limited number of research professorships, to be open to investigators in the stations who have displayed marked ability and become entitled to special recognition. Such positions would stimulate interest in research as a career, and prove an added inducement to those of eminence to remain in that field rather than go over into administrative or commerical positions.

That the funds at present available for the experiment stations are wholly inadequate, and that these institutions have been left behind in the forward development of other branches of the agricultural work, was further emphasized in the discussion before the station section.

Dean Curtiss expressed the belief that there has not been a time within the past quarter of a century when our research work in

agriculture has faced such critical conditions as at present; and he made the point that other lines like instruction and extension will recover much more quickly than research. Referring to the fact that experiment station work has not received proper emphasis and support in many States, and that it has been under serious handicap in other States, he said: "I think we will need to place greater emphasis upon the experiment station and give it a more prominent place, a place of higher recognition, and make it more independent of the instruction work." He advocated a force selected by reason of distinctive qualifications and training, and the devotion of time exclusively to investigation. He also held that the position of research men who have demonstrated their ability should correspond in rank with that of heads of departments, although not independent of the latter.

Dean Watts characterized agricultural research as "the weakest link in our agricultural program" from the standpoint of support for maintenance. He showed that for every dollar of Federal money devoted to agricultural experiments considerably over three dollars are available for extension, despite the fact that research is expensive. He indicated that unless adequate provision is made to meet the present shortage of funds for experimental purposes the satisfactory advancement of the entire agricultural program will be retarded. He urged that each State should provide a sum equal to the Federal allotment, and that efforts be made to secure increased Federal appropriations.

On the basis of a questionnaire circulated among the station directors, Dean Burnett confirmed the view that the funds available are much below the requirements of the various States, except in a few cases having liberal local support. He showed that in many cases no new projects are now being established except as old ones are completed, and that even then the money thus released is often needed to meet the growing expenses of the station. Pointing to the fact that the attention of young men in agricultural colleges is being directed away from research toward other lines, he prophesied that the stations would have to be put on a broader and better basis before the situation could be remedied.

The section adopted a resolution earnestly recommending that the Association "take cognizance of the paralysis threatening the work of the stations," and seek a substantial increase in the Federal appropriation. A similar resolution was adopted by the extension section, which evidenced a realization of the situation and its vital relation to the efficiency of all extension effort. These resolutions received the indorsement of the executive committee, which recommended that the present needs of the stations be presented to Congress with a view to securing a supplementary appropriation.

The executive committee also endorsed the need of substantial salary increases, as pointed out in reports of the committees on college and experiment station organization and policy, a resolution of the college section, and several speakers. It appeared that a large number of the colleges had already felt the importance of such a step and had provided for quite general advancement.

Another matter which assumed considerable prominence in the Chicago meetings was that of cooperation in research. Reference has been made to Dr. Angell's address, the central theme of which was the organization of research and its effective coordination. He combated the idea that the investigator should be given unqualified freedom and protected in working alone. A large part of the research product, he maintained, is not the result of special genius, and great opportunity lies in the field of ordinary ability. There are many scientific problems which no one scientist working alone is equipped to handle. The need was emphasized for cooperation which brings together scientists in neighboring fields; and cooperation in planning was deemed well worth while even if it went no further.

The subject was one of the leading features in the program of the experiment station section, where a symposium was presented by three speakers with formal papers. Director C. E. Thorne read a paper on cooperation and correlation in relation to soil fertility investigations, and Dr. H. C. Taylor discussed the reorganization of the Office of Farm Management and the extensive plans for conducting its studies in cooperation with the agricultural colleges and experiment stations.

The symposium developed the fact that there was considerable difference of opinion on the value of cooperative effort in station work, the type of investigation to which it is best suited being held to be the large problems in which two or more States are particularly interested, regional questions or those involving different climatic or other factors, and broad basic problems in which a considerable accumulation of data is important. The desirability of standardizing methods of experiment so that the results at different stations will be comparable was emphasized, and it was suggested that in the case of large questions the problem might be divided among a number of workers or that the field might be divided among stations on the basis of climatic or other limiting conditions. The advantage of organized effort in stimulating interest in specific problems was pointed to; and frequent conference among investigators was made a condition of successful cooperation or coordination.

The importance of sufficient duplication to secure a high degree of certainty was urged by several speakers, since it is of first importance that publicly supported research should be able to withstand

the most critical examination by scientific method and the most varied test in practical application. The nature of some of the criticisms and attacks by scientific men on one another was thought to lead to "a great and growing skepticism in the mind of the general public of the soundness and impartiality of the findings of research." The development of a real spirit of constructive cooperative attack, and a more friendly and tolerant attitude between investigators, it was believed would do much to remedy public distrust of the objects and the methods of research workers.

Cooperation was also referred to as a means of husbanding the meagre resources of the stations, securing larger results and greater progress in certain lines for the public money spent, avoiding unnecessary duplication, and standardizing the conduct of experiments in similar lines so that they will be more directly comparable.

An illustration of the opportunity for beneficial working together was furnished by Director Thorne in the subject of carriers and forms of phosphorus used as fertilizer. Analyzing the various factors involved in a complete study of the subject he concluded that "no one station can furnish a final answer to all these questions, for they must be studied under a wider range of soil and climatic conditions than are found in any single State. Moreover, the scope of the investigation is so broad that few stations will feel able to undertake the entire inquiry; but by parceling out the work, assigning part to one State and part to another, and so articulating the whole that there will be a common ground on which all will meet, it will be possible at least to very materially enlarge the boundaries of our knowledge on this subject."

In outlining the plans for studies in farm management and farm economics, Dr. Taylor made the point that cooperation is quite necessarily involved, since in considerable extent it involves a crystallizing of the results of investigation in other branches, as well as securing data of wide scope and volume. Hence in his judgment the establishment of right relations with other workers in the field of agricultural research demands the right application of the principles of division of labor and cooperation.

The broad question of a closer union and understanding between the work of the stations themselves and that of the Federal Department of Agriculture was presented in the report of the committee on projects and correlation of research. The report suggested that the time had come for formulating plans looking to more definite coordination. It suggested the provision of an agricultural research council, to be composed of representatives from the stations and the Department, with headquarters in Washington. Such a council, it was thought, would first make a survey of all the work of the stations and the Department, and on the basis of this would

formulate plans for effective correlation and coordination in such features as might seem desirable. It was designed through this council to bring the stations and the Department into more intimate relations and to effect a better understanding of the work of both agencies.

The proposal met with considerable favor on the part of station directors, was approved by the experiment station section, and later by the association, and the executive committee was instructed to confer with the Secretary of Agriculture in reference to the establishment of such a council.

Closely related to the subject of the organization of research is the matter of internal organization and administration, which was referred to on several occasions. Dr. Jordan endorsed a statement in last year's report on station organization and policy, to the effect that efficient management "calls for a type of administrative leadership in the stations both competent to guide scientific investigation and with sufficient time for the thoughtful study of work and plans." He took the position that "an experiment station is entitled, if its best interests are to be conserved and its work made as efficient as possible, to have an administrative head who has no other duties. Moreover he should be a man who has actually engaged in research himself. It makes little difference what the field of research is in which he has been active, provided he has come to comprehend sound methods and has acquired an active appreciation of the care and severity with which inquiries should be prosecuted. It is in my judgment a mistake to combine with duties of director teaching duties or other administrative functions."

The current report of the committee on station organization and policy cited a number of directors as referring to the necessity of dividing time of station men with other departments of the college, as a continued disadvantage to the station work. If a station worker has more than nominal connection with teaching his duties are likely to be added to when pressure comes, as was the case this past fall when the attendance at many colleges largely increased. The chief argument for such dual services is expediency or necessity due to lack of funds. It was urged that a more general differentiation in working force is a natural corollary to the differentiation of function which has become commonly accepted. It was suggested that stations might often be stronger as purely research institutions if they had a smaller number of persons on the staff, but these of high ability in research and allowed to concentrate their best efforts in that field.

A number of speakers advocated a station force selected by reason of its distinctive qualifications and training for research, and the devotion of time exclusively to it.

Reference was made also to the importance of simplifying or narrowing problems taken up for investigation, resolving broad, complex questions into factors or phases which lend themselves to scientific investigation. Speaking of this Dr. Jordan said: "A very just criticism of the work of experiment stations in the past is that experiments have been carried on so complex in regard to the various factors that have reacted upon the results that no safe conclusions could be drawn in regard to the influence of any one factor. This is true of a large proportion of the field experiments and feeding experiments which have been conducted. . . . If there is any one point of view which needs to be enforced by our experiment station administrators it is that we shall narrow our problems to single factors. We will make little progress until we do this."

The soundness of this contention will appeal to all familiar with station investigation and experiment, and has frequently been emphasized in these pages. Failure to recognize the complex character of subjects presented for investigation and to analyze these problems into workable parts is one of the serious weaknesses in agricultural research. It is accountable for efforts which are unsuccessful or abortive, and it results in an unprofitable use of time and funds. It is a matter deserving of much greater administrative attention.

There was much in the spirit of the times to cause the Chicago convention to evidence a broadening realization of the ultimate function and responsibilities of the land-grant colleges. They are concerned not only with the technical aspects of production but with the conditions under which agriculture is conducted and the welfare of the people living under it. This brings them into increasingly close contact with problems relating to the business side of farming and to life and progress in the country. These wider relations represented in their charter stood out more clearly at this time than ever before to challenge larger attention and incite leadership.

Secretary Houston referred to this when he declared that the colleges owe a duty outside their technical fields of investigation and education, and have a larger task even than that of improving farming. This duty he conceived to be the exercise of leadership along broader lines, the preservation of American ideals and institutions, the Americanization of those who have recently come among us, the exaction of regard for facts and their rightful interpretation by public men. A similar thought was expressed by President Lory relative to the broader duty of engineering toward public affairs and in industrial emergencies.

Altogether, therefore, the convention was one to furnish new inspiration and vision, and to give increasing conviction of the large place these land-grant institutions occupy in the welfare of the Nation.

# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**The art of searching chemical literature,** H. Hibbert (*Chem. and Metal. Engin., 20 (1919), No. 11, pp. 578–581*).—In this article the question of conducting a search of the chemical literature is dealt with particularly from the point of view of the technical chemist. Methods are suggested, and journals and reference books listed, for the systematic investigation of the literature on organic chemistry, biochemistry, and mining and metallurgical chemistry. Attention is called to special literature for specific information and to certain general indexes.

**The condensed chemical dictionary,** F. M. Turner, jr., D. D. Berolzheimer, W. P. Cutter, and J. Helfrich (*New York: Chem. Cat. Co., Inc., 1919, pp. 525*).—This reference book of information regarding chemicals and chemical materials ordinarily met with in commerce is designed especially for nonchemists such as exporters and importers, brokers and jobbers, financial houses, lawyers, librarians, purchasing agents, insurance companies, etc., who come in contact with chemical industries.

The data compiled for each substance consist in general of the chemical and commercial names, formula, physical properties, analytical constants, derivation, grades, containers, uses, fire hazard, and railroad shipping regulations. Although the properties described have been restricted to those likely to be of commercial importance and many substances of scientific interest but of no commercial importance have been omitted entirely, it is the hope of the authors that the dictionary will be of considerable value to the chemist as well as to the nontechincal user.

**Handbook of chemical preparations, a reference book for workers in chemical laboratories,** L. Vanino (*Handbuch der Präparativen Chemie, ein Hilfsbuch für das Arbeiten im Chemischen Laboratorium. Stuttgart: Ferdinand Enke, 1913, vol. 1, pp. XX+670, figs. 82; 1914, vol. 2, pp. XVI+849, figs. 26*).—This handbook, the aim of which is set forth in the subtitle, consists of two volumes, the first dealing with inorganic and the second with organic preparations. Substances of only special interest and methods which are considered of doubtful value are purposely omitted, but for each of the large number of elements and compounds selected a choice of several methods of preparation is given, with references to the original literature and with a summary of the important properties of the substances in its pure state.

**Reports of the progress of applied chemistry** (*Ann. Rpts. Soc. Chem. Indus. [London] Prog. Appl. Chem., 1918, vol. 3, pp. 495; abs. in Nature [London], 103 (1919), No. 2596, pp. 421–423*).—This volume contains the following sections: Plant and Machinery, by J. W. Hinchley; Fuel, by J. T. Dunn; Gas, Destructive Distillation, Tar Products, by A. Meade; Mineral Oils, by A. Philip; Coloring Matters and Dyes, by G. T. Morgan; Fibers, Textiles, Cellulose, and Paper, by J. F. Briggs; Bleaching, Dyeing, Printing, Finishing, by S. H. Higgins; Acids, Alkalis, Salts, Etc., by H. A. Auden; Glass, Refractories, by W. J. Rees; Metallurgy of Iron and Steel, by C. O. Bannister; Metallurgy of the Nonferrous

Waxes, by C. Revis and E. R. Bolton; Paints, Pigments, Varnishes, and Resins, by L. M. Nash; India Rubber, by D. F. Twiss; Leather and Glue, by F. C. Thompson; Agricultural Chemistry, by E. J. Russell; Sugars, Starches, and Gums, by J. P. Ogilvie; Foods, by H. W. Bywaters; Water Purification and Sanitation, by E. Ardern; Fine Chemicals, Medicinal Substances, Essential Oils, by G. Barger; and Photographic Materials and Processes, by B. V. Storr.

In the sections on Agricultural Chemistry and Foods the literature of the past three or four yeaers is reviewed, while the remaining sections cover, in general, the literature of 1918. In all sections the influence of war conditions on the trend of progress in applied chemistry is shown.

**Acid fermentation of xylose**, E. B. Fred, W. H. Peterson, and A. Davenport (*Jour. Biol. Chem., 39 (1919), No. 2, pp. 347–383, pl. 1, figs. 3*).—Organisms have been isolated from sauerkraut, silage, and manure which are capable of fermenting xylose rapidly, with the formation of acetic acid and lactic acid in the proportion of about 43 gm. of the former to 57 gm. of the latter, the two acids together representing about 90 per cent of the sugar consumed. The maximum amount of acid per gram of xylose fermented is obtained in cultures containing from 2 to 3 per cent of xylose. Sugars other than xylose are fermented by these organisms with the production of acetic and lactic acids, but in much smaller amounts.

The organisms, to which the name *Lactobacillus pentoaceticus* n. sp. has been given, are nonsporing, gram-positive, facultative anaerobes growing best with a lowered oxygen tension and at a pH of from 3 to 8.6. In yeast water or cabbage juice solutions xylose is fermented much more rapidly than in water solutions containing nitrogen from beef extract, peptone, or gelatin.

The authors call attention to the occurrence of these organisms in silage and their possible significance in the production of the acids of silage.

**The action of ptyalin**, H. McGuigan (*Jour. Biol. Chem., 39 (1919), No. 2, pp. 273–284*).—The action of ptyalin upon starch was determined by digesting a starch solution in an incubator at 40° C. with varying amounts of saliva, diluted 1:5 or 1:10, and filtered. One or 2 cc. samples of the digest were taken at stated intervals, boiled with 8 cc. of Benedict's picric acid solution and 2 cc. of 20 per cent sodium carbonate, made to a convenient volume, and matched in the calorimeter against a standard containing 1 or 2 cc. of a 0.1 per cent dextrose solution.

The results obtained, which are considered to be accurate within 5 per cent, indicate that ptyalin in dilute solutions acts on starch at a rate directly proportional to the amount of ptyalin present until digestion is interfered with by the products formed. The point of equilibrium is reached when about 70 per cent of the starch calculated as dextrose is converted into sugar. The chief cause of the establishment of equilibrium has not been discovered, but the theory is advanced that, since practically the same amount of sugar is formed by the same amount of ptyalin in varying concentrations of starch solutions, the ptyalin may unite quantitatively with the starch during digestion and exert a force which causes hydrolysis. When the starch molecule is converted into sugar the ptyalin is again free to unite with more starch. Dextrose and maltose are thought not to interfere with the normal process of digestion of the starch.

**Note on the preparation of a purified agar powder with increased powers of filtration**, J. Cunningham (*Indian Jour. Med. Research, 6 (1919), No. 4, pp. 560–568, figs. 2*).—The method described consists of a preliminary soaking of the crude agar for ten minutes with dilute hydrochloric or sulphuric acid, after which the product is thoroughly washed with running water until all traces of

acid have disappeared. After removing the excess water, the agar is placed on cotton wool filters in funnels resting in filtering tins. These are then autoclaved at 120° C. for one hour. The agar thus melted, sterilized, and cleaned is an approximately 9 or 10 per cent solution, which on cooling, forms a firm jelly. This is broken up into fine threads by passing through a rotary meat grinder. The threads are spread evenly in a thin layer over a number of metal trays, which are placed in a specially designed drying oven and desiccated at a moderate heat.

A series of observations made during the manufacture of different batches of desiccated agar by the above process is reported, which indicates that the best results are produced by the use of a weak solution of sulphuric acid (0.01 per cent). A one per cent solution of agar thus prepared is said to be absolutely firm and suitable for agar slants.

The process is recommended as furnishing a material which, for ordinary purposes, requires no further filtration, and which, owing to the sterilization during the process of manufacture, does not require subsequent sterilization at high temperatures.

**New apparatus for the desiccation or concentration of liquids at a low temperature**, L. Marmier (*Ann. Inst. Pasteur, 32 (1918), No. 4, pp. 145–149, figs. 2*).—The apparatus described and illustrated in this article consists of an evaporator connected with a vacuum pump and tubular condenser and surrounded by an outer jacket through which water at the desired temperature is allowed to circulate. The liquid to be condensed is admitted into the evaporator through a closely fitting funnel communicating with two or more horizontal tubes with perforated outlets, which cause the liquid to be thrown out in a fine spray against the side of the evaporator as the funnel is rotated by means of a pulley or pinion. The funnel is also provided with paddles, which scrape off the condensed product into the lower part of the evaporator.

The author states that the apparatus has been used successfully for the concentration of fresh raisin must and glycerinated serums and for the desiccation of quantities of milk serum and blood. The temperatures of the water bath for these concentrations and desiccations varied from 36 to 45° C., while the temperature within the evaporator was as low as from 20 to 26°.

**A new distilling column for laboratory use and its efficiency**, M. H. Robert (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 20, pp. 998–1000, figs. 2*).—The apparatus consists of a column of connecting bulbs each partially filled with glass beads and the whole sealed within an outer glass jacket in which a high vacuum can be maintained. This is surmounted by a reflux air condenser of any type that affords a large condensing surface and in which the flow of air can be regulated. The inner tube of this condenser is connected with the inner tube of a third condenser. This tube is shorter than the surrounding jacket, to which it is fastened at the lower end only. In this tube is suspended a thermometer which, owing to the fact that the outer jacket is closed except for an exit tube at the lower end, records the exact temperature of the condensed liquid. The distillation is controlled by regulating the heating of the flask and the current of air in the reflux condenser.

It is said that by means of this apparatus certain separations may be effected quantitatively in a very short time.

**A study of the lactose, fat, and protein content of women's milk**, W. Denis and F. B. Talbot (*Amer. Jour. Diseases Children, 18 (1919), No. 2, pp. 93–100*).—The experimental work on human milk reported in this paper consisted of studies of the composition of milk at different stages of lactation, of milk at the beginning and end of a single nursing, of milk taken practically

simultaneously from the right and left breasts, and of the variations in composition of milk taken at three-hour periods during the course of a single day. Lactose was determined by the titration method of Folin and Denis (E. S. R., 38, p. 615), fat by the Babcock method or, when the amount of material was limited, by Bloor's nephelometric method (E. S. R., 32, p. 312), and protein by the Kjeldahl method. The detailed results are presented in tabular form.

There was found to be a rapid increase in lactose during the first few days and a further increase as lactation progressed. This was accompanied by a corresponding decrease in protein. After the colostrum period there was apparently no relation between the stage of lactation and the amount of fat in the milk. The percentage of lactose was usually higher, and fat lower, at the beginning of a single nursing than at the end. There was little if any difference in the protein. The milk taken simultaneously from both breasts of the same woman tended to have the same composition, but often varied in the percentage of fat. The percentage of fat was as a rule higher at midday or midafternoon than at other times during the day.

The results emphasize the importance in the analysis of human milk of obtaining samples both before and after nursing, instead of making the analysis on the first ounce of milk drawn.

**The nonprotein nitrogenous constituents of cow's milk.** W. DENIS and A. S. MINOT (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 453–458*).—Figures are given for the nonprotein nitrogen, amino nitrogen, urea, uric acid, creatinin, and creatin in cow's milk as determined by the methods previously described (E. S. R., 40, p. 509). Determinations were made on the mixed product of 4 large milk distributing plants, on 38 samples of milk from individual cows in 3 dairies, on milk obtained from 7 cows fed rations of known composition, and on milk obtained from a single cow during the first 4 weeks after calving.

While different samples of mixed milk of a large number of cows gave practically uniform results, the milk taken from individual cows in different dairies showed noticeable differences in the values for nonprotein nitrogen and urea. The content of nonprotein nitrogen, amino nitrogen, and urea was found to be influenced by the character of the food, being increased in high protein and decreased in low protein feeding. The content of these same constituents was found to be high in colostrum, and to approach normal values only on the fourth day after delivery.

**Peroxidases in milk.** H. VIOLLE (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 5, pp. 248–250*).—The freshly cut mammary glands of guinea pigs, washed free from blood and milk, were found to react positively to the guaiacum peroxidase test, although the milk exuding from such glands gave a negative test. This is thought to indicate that normal fresh milk may contain only traces of oxidizing diastases, while milk from diseased glands is likely to contain larger amounts. It is further pointed out that although heating to 78 or 80° C. destroys peroxidases, heated milk may be easily adulterated by the addition of peroxidase-containing substances. The author therefore concludes that the quality of milk can not be judged by the peroxidase reaction.

**Concentration of ammonia in blood.—Comparison with concentration of ammonia in different secretions and tissues, especially muscle tissue.** K. L. GAD-ANDERSEN (*Jour. Biol. Chem., 39 (1919), No. 2, pp. 267–271*).—A method of estimating ammonia and urea in muscle is outlined by means of which the transformation of urea into ammonia after death is thought to be prevented. This is brought about by stunning the animal on the back of the head, excising the muscle as quickly as possible, and keeping it under alcohol at a temperature of −20° C. until the determinations are made. Ammonia is estimated by aeration and urea by the urease method.

A comparison of the ammonia and urea content of muscle as determined by this method with that of blood estimated by a new micro method indicates that, contrary to the results of earlier investigators, the concentration of ammonia is the same in muscle and in blood. If muscle is left for some time an increase in the concentration of ammonia takes place with a corresponding decrease in urea, the sum of the two values remaining constant. The concentration of ammonia in bile, spinal liquid, and aqueous humor is also reported to be the same as in blood.

The microdetermination of nitrogen by direct nesslerization and of total solids, in drop quantities of human blood, A. W. Peters (*Jour. Biol. Chem., 39 (1919), No. 2, pp. 285–298*).—A method is described for the determination of total and nonprotein nitrogen and of total solids in 15- to 30-drop quantities of human blood.

If the three determinations are to be made on the same composite sample, a maximum of 30 to 35 drops of blood is collected in a weighed centrifuge tube containing a small amount of 0.5 per cent sodium fluorid solution. The tube is rotated to mix the contents, weighed to determine by difference the weight of blood, and made up to a volume of 8.5 cc. with the sodium fluorid solution. One cc. of this volume is pipetted into a graduated cylinder and diluted with the collection medium to such a volume that the liquid will represent about 10 mg. of blood per centimeter. This is used for duplicate determinations of total nitrogen.

For the determination of total solids, 2 cc. of the original dilution of blood is pipetted into a small tube containing a few decigrams of pure dry talcum powder. The tube is rotated to distribute the powder uniformly over the inner surface, and is then heated in a nearly horizontal position in a drying oven at 75° C. to constant weight. For nonprotein nitrogen, two determinations are made with 2 cc. each of the original dilution of blood or one of 5 cc., depending upon whether about 30 or about 15 drops of blood have been collected.

Standard conditions for conducting the Kjeldahl digestion for both the total and nonprotein nitrogen and for the direct nesslerization of the digests are described in detail. The chief feature of the latter determination is the use of an inorganic color standard, which is matched in varying amounts against a fixed length of column of the different unknowns, and not vice versa as is customary. The standard solution is made by dissolving 6 gm. of ferric ammonium sulphate in 75 cc. of cold distilled water, adding 2 cc. of a 1 per cent picric acid solution, and making the volume up to 100 cc. with distilled water. The mixed color standard is said to remain perfectly clear and of constant intensity of color for a week or more. The quantitative evaluation of the colorimetric results has been adjusted to variations of analytical conditions, so that the variability and certainty of results are said to lie within a few thousandths of a milligram of nitrogen.

Determination of ammonia in blood, O. Folin (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 259, 260*).—The author calls attention to numerous sources of error encountered in the determination of ammonia in blood by the method described by Morgulis and Jahr (E. S. R., 41, p. 413).

Bacon curing on the farm, J. B. Fisher (*Rhodesia Agr. Jour., 16 (1919), No. 3, pp. 202–209, pls. 4*).—This article contains suggestions for the selection and fattening of pigs to be used for bacon, a list of tools necessary for farm bacon curing, directions for slaughtering, methods for curing the bacon by the dry salt and brine processes, and a description of a simple smokehouse.

Home drying of fruits and vegetables in Washington, F. O. Kreager and I. N. Armstrong (*Wash. State Col. Ext. Dept., Ser. 1, No. 58 (1919), pp. 31, figs. 7*).—This bulletin deals with the principles of food preservation in general, the

factors and principles involved in preservation by drying, the construction and operation of sun and artificial heat driers, and general and special processes in drying. Special directions are given for the drying of several vegetables and fruits and their subsequent treatment. Tables from Weather Bureau reports are included to show the varying conditions of sunshine, temperature, and humidity in different parts of the State (Washington), and the suggestion is made that in order to develop intelligent methods of drying for any particular community a careful study should be made of the principles of drying and of the climatic conditions of that community.

**Industrial drying**, P. RAZOUS (*Théorie & Pratique du Séchage Industriel. Paris: H. Dunod & E. Pinat, 1919, 2. ed., rev., pp. 253, figs. 65*).—This volume consists of two parts, the first of which deals with the general principles of evaporation, the principal types of hot air driers, mathenfatical calculations relative to the establishment of hot air driers, the use of ventilators for the circulation of the hot air, and various heating systems. The second part describes the commercial drying of a wide variety of substances, with advice as to the most economical methods of drying each. Among the materials treated are phosphates and superphosphates, hides, textile material, paper, fruits, vegetables, malt, wood, and fish. The closing chapter gives brief notes on the drying of special materials, including bones, rubber, celluloid, sugar, flour, food pastes, confectionery, pharmaceutical nfaterials, and milk.

**The manufacture of tomato products**, W. G. HIER (*Denver: Author, 1919, pp. IX+121, figs. 7*).—This manual describes the modern methods for the commercial manufacture of tomato products, and points out the advantages and disadvantages of the different methods considered. Part I deals with the manufacture of whole tomato pulp or puree from the selection of the tomato stock, through the washing, sorting, pulping, and condensing processes to the canning and storing of the finished product. A chapter is included on the microorganisms of tomato products, the attitude of the pure food authorities toward them, and the interpretation of analyses. Part II deals with the manufacture of tonfato catsup, chili sauce, trimming pulp, and tomato soup.

**The manufacture of tomato paste**, J. H. SHRADER (*Amer. Food Jour., 14 (1919), No. 9, pp. 13, 14, 35*).—The process of manufacture of tomato paste is outlined briefly, and various precautions that must be taken to insure a satisfactory product are discussed. The term tomato paste is given to tomato juice concentrated in the ratio of 5:1. When concentrated in the ratio of 2:1 the product is called tomato pulp, 2.5 or 3:1 tonfato puree, and 10 or 12:1 double concentrated. The estimate is given that, in comparison with the manufacture of canned tomatoes, an equal tonnage of tomatoes if converted into paste will require only 25 per cent of the labor, with a reduction of 33 per cent in the consumption of tin and of 50 per cent in cannery waste. The freight saving is indicated by the fact that a 6-oz. paste can contains practically the equivalent of a 32-oz. ordinary tomato can.

**Vinegar from wine**, A. MARESCALCHI (*L'Acето di Vino. Casale Monferrato: Marescalchi Bros., 1918, pp. VII+127, figs. 9*).—This pamphlet contains directions for the preparation of vinegar from wine on a domestic and an industrial scale; and a discussion of possible diseases, alterations, and defects in such vinegar; methods for the analysis of vinegar, and for the detection of adulterations; tables of the composition of Italian wine vinegar; and recipes for the preparation of toilet and medicinal vinegars, including some of historical interest.

**Grape-shoot silage a source of alcohol and of tartaric acid**, VENTRE (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 9, pp. 334–340*).—The author states that in the grape-growing regions of France it has been customary for a number

of years to ensile grape shoots cut soon after the grapes have been picked and while still in leaf. The silage thus obtained, when subjected to distillation, was found to yield from one to two per cent of alcohol, consisting of 94.8 per cent ethyl and 5.2 per cent methyl alcohol. The stems yielded a slightly larger amount of alcohol than the leaves. The mother liquor left after distillation contained tartaric acid in the proportion of 1.3 per cent in the stems and 1.68 per cent in the leaves.

**A simplified process for the preparation of gluconic acid**, A. HERZFELD and G. LENART (*Ztschr. Ver. Deut. Zuckerindus., 1919, No. 758, II, pp. 122–128*).—In the method proposed, one part of glucose dissolved in five parts of water is shaken with one part of bromin for a number of hours, and after standing for 24 hours is distilled in vacuo until the liquid is colorless. The residue diluted with water is treated with the calculated amount of sodium carbonate to neutralize the hydrobromic acid, and in the hot with an excess of calcium carbonate to bind the gluconic acid. On filtering and cooling, the calcium salt of gluconic acid crystallizes out and can be purified by recrystallization from a water solution.

The method was developed with a view to utilizing the resulting gluconic acid as a substitute for cane sugar.

**An important consequence of the industrial synthesis of ammonia**, G. CLAUDE (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 20, pp. 1001, 1002*).—The author suggests the advisability of transforming synthetic ammonia into ammonium chlorid by the Solvay process of manufacturing sodium carbonate, and using the ammonium chlorid thus formed as a fertilizer.

The advantages are pointed out of this transformation as compared with the manufacture of ammonium sulphate for like purposes.

## METEOROLOGY.

**The climate of Liberia and its effect on man**, E. Ross (*Geogr. Rev., 7 (1919), No. 6, pp. 387–402, figs. 4*).—The author summarizes the limited meteorological data available, consisting mainly of observations by himself and L. A. Hurt, on temperature, pressure and precipitation at Schiefflin, Liberia, from May, 1913, to October, 1915, inclusive, and by the German-South American Telegraph Company at Monrovia from January, 1915, to July, 1916, inclusive.

The mean annual temperature calculated from these records was 78.5° F. The warmest month was March, 80.4°, and the coolest months, July and August, 76.4°. The highest recorded shade temperature was 93°. "The rainy season occupied about seven months of the year, from mid-April to mid-November. During these seven months the precipitation was 170 in. out of the annual total of 179.5 in. . . . The period of longest drought ran from December 28, 1913, to February 19, 1914—a total of 54 days, during which time 0.1 in. of rain fell on the thirty-second day. During July and August there is a period of lessened precipitation known locally as the 'middle drys.' . . .

"The sensible temperatures of the Liberian coast are not so high as those of many places in intermediate latitudes. . . . Yet, while the heat is not so extremely and sharply oppressive during a given day or week as may be the case in other and more temperate regions, it is much more dangerous in its steady persistence and the cumulative effect is extremely enervating. Insolation values are exceedingly high. . . . Negligent or ignorant exposure by a European of a bare head to the sun for periods of 2, 5, 10 minutes, and the like, has resulted at once in prolonged, pernicious fevers and sometimes in death."

The habitability of the coast region is improved by land and sea breezes, and of the interior by elevation. Humidity is high, and the dry season is characterized by excessive dews which are sufficient to support plant life. Travel, transportation, communication, and food supply are controlled to a large extent by the rainfall. White people can maintain health only by great care in matters of sanitation and personal hygiene. "At present the relation of whites to the African West Coast can only be one of tolerance."

**Climate of British Columbia**, F. N. DENISON (*Brit. Columbia Dept. Agr. Bul. 27, 4. ed. (1919), pp. 23*).—Tables give data for temperature, precipitation, and sunshine for the various districts of British Columbia during 1916, 1917, and 1918.

"Generally speaking, the climate of this Province greatly resembles that of the European countries lying within the same parallels of latitude, and extending from the British Isles to the Baltic Provinces. Owing to the tempering effect of the Pacific Ocean, the winters on the coast are remarkably mild and the summers cool. Heavy rains occur in winter on the west coast of Vancouver Island and on the western side of the coast mountains on the mainland, while on the eastern portion of Vancouver Island the precipitation is comparatively light, and at the southern extremity about Victoria it is remarkably so, while the amount of bright sunshine exceeds that recorded at other British Columbia stations. Throughout the interior of this Province the precipitation and temperature vary greatly, according to local physical conditions. In some districts between the mountain ranges the rainfall is so light that irrigation is necessary, and maximum summer temperatures range from 90 to 100° F."

**Climate of Brazil** (In *Dados Estatisticos. Rio de Janeiro: Min. Agr., Indus. e Com., 1918, pp. 13–33*).—Tabulated data are given for temperature and precipitation for various places during each month, 1912–1916.

**Nitrogen and other compounds in rain and snow**, J. E. TRIESCHMANN (*Chem. News, 119 (1919), No. 3094, p. 49*).—Continuing accounts of previous studies (E. S. R., 38, p. 416), the author summarizes the results of determinations of nitrogen compounds, sulphates, and chlorin in rain and snow at Cornell College, Iowa, from October 1, 1918, to June 15, 1919.

## SOILS—FERTILIZERS.

**A soil classification for Michigan**, C. O. SAUER (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 83–91*).—As a result of studies at the University of Michigan, it is stated that with reference to Michigan soils, "the Bureau of Soils [U. S. Department of Agriculture] classification appears too assertive of the specific identity of soils, too inadequately formulated in the bases of classification, and involved in inconsistency in its largest division, the soil province. As alternative to the establishment of hard and fast soil types, Michigan soils may be classed according to a system similar to that formulated by the committee of the American Society of Agronomy. . . . The five Atterberg divisions appear to supply a sufficient determination of sizes of soil particles for Michigan conditions, and to be preferable in the determination of upper and lower limits of size."

On this basis a soil classification for Michigan is formulated.

**Soil survey of Buena Vista County, Iowa**, L. V. DAVIS and H. W. WARNER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 37, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 365,440 acres in northwestern Iowa, which topographically includes a morainic division with almost no natural drainage and an erosional division well supplied with natural drainage. The county lies

just within the glacial portion of the glacial and loessial province. Ten soil types of 7 series and 2 miscellaneous types are mapped, of which the Carrington loam and silt loam cover 48.6 and 27.8 per cent and the Webster silty clay loam 15.7 per cent of the area, respectively. All of the soils of the county are predominantly dark colored and well supplied with organic matter.

Soil survey of Henry County, Iowa, A. H. Meyer and T. H. Benton (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 32, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 273,280 acres in southeastern Iowa, the topography of which ranges from almost flat to steeply rolling. As a whole the county is well drained. The soils of the county are mainly of glacial drift and loessial origin. Thirteen soil types of 10 series are mapped, of which the Grundy silt loam, Clinton silt loam, and Grundy silty clay loam cover 39.4, 26.9, and 14.9 per cent of the area, respectively.

Mississippi: Its geology, geography, soils, and mineral resources, E. N. Lowe (*Miss. Geol. Survey Bul. 14 (1919), pp. 346, figs. 22*).—This is a revision of Bulletin 12, issued in 1915 (E. S. R., 35, p. 213).

The agricultural soils of the Italian colonies, A. Maugini (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 381–396*).—This is a summary of data from a large number of sources on the physical and chemical composition of the agricultural soils of Eretria, Somali, Tripoli, and Cirenaica.

Soils, B. de Marchand (*Union So. Africa Dept. Agr. Rpt. 1917–18, pp. 113–115*).—Analyses of 18 samples of soils of five different general types are reported, the general characteristics of which are deficiency in lime and phosphoric acid, together with a relative sufficiency of potash and a fair content of nitrogen.

Notes on some Poverty Bay soils, B. C. Aston (*Jour. Agr. [New Zeal.], 17 (1918), No. 4, pp. 196–200, fig. 1*).—Analyses of 16 samples representative of the soils of the Poverty Bay region of New Zealand are reported, leading to the conclusion that the majority of these soils show every chemical indication of great natural fertility. The soils of the area are thought to be composed entirely of river silts and coarser particles, and the mechanical analyses showed no clay fractions in any case.

The need and objects of a soil survey in the Punjab, B. H. Wilsdon (*Agr. Jour. India, 14 (1919), No. 2, pp. 281–290, pls. 3*).—This article deals with the importance of a soil survey in India, and reports mechanical analyses of different Indian soils as a basis for suggested soil classification.

A new method of analysis by washing and sedimentation, G. Wiegner (*Landw. Vers. Sta., 91 (1918), No. 1–2, pp. 41–79, figs. 7*).—The author describes a method and apparatus for wash analyses, based on the variation of the specific weight of soil grains and especially of disperse particles during sedimentation. A formula corresponding to the theory is given as follows: $p=\frac{Pvt}{h}$, in which $p$=the weight of the soil after it has settled for a time=$t$, $v$=velocity of sedimentation, $h$=distance of settling, and P=the weight of the soil when $t=0$ at the beginning of the experiment. The curve of settling, showing quantities of soil and time, could be reproduced for the same soil, and was found to be independent of the height of settling or of the quantity of soil used. Small additions of electrolytes such as potassium chlorid changed the curve entirely.

The chemical composition of clay obtained by the Atterberg washing method, E. Blanck (*Landw. Vers. Sta., 91 (1918), No. 1–2, pp. 85–91*).—A study of the chemical composition of clay obtained from six widely different soils by mechanical analysis according to the Atterberg method is reported. From

this it was concluded that this clay has a more individual chemical composition than that obtained by mechanical analysis according to the old Schloesing-Grandeau method, and that chemically this clay does not correspond to pure kaolin but progressively approaches it.

Studies of water absorption, percolation, evaporation, capillary water movement, and soil erosion under field conditions, M. F. MILLER and F. L. DULEY (*Missouri Sta. Bul. 163 (1919), pp. 65, 66*).—The preliminary results of an experiment in which a series of plats was subjected to different systems of cropping and cultivation to determine their effects upon water entering the soil and upon soil erosion showed that the amount of water running off the land during the summer of 1917 from the uncultivated plat was 51.4 per cent of the total rainfall, or about twice the amount which ran off the cultivated plat and more than four times the amount leaving when the plats were kept in grass. The erosion from the bare plat where the weeds were kept down was only slightly greater than that from the cultivated land in spite of the fact that the run-off was greater, but the amount of run-off from the bare plat was nearly thirty times as much as that from the plat kept in sod. The other plats which are not quite so extreme in treatment, such as those in corn and those in small grain, have amounts of run-off which are intermediate between these.

An investigation of soil water, E. McK. TAYLOR (*Essex Ed. Com., East Anglian Inst. Agr., Chelmsford, Bul. 25 (1919), pp. 7*).—This pamphlet describes a method of obtaining soil water samples by burying pads of absorbent filter paper in the soil for definite periods of time and then extracting the absorbed soil solution by pressure from the pads; and reports analyses of such soil water samples obtained from (1) a derelict soil growing grass for 35 years, (2) a productive chalky bowlder clay soil unfertilized for 5 years, (3) a highly cultivated chalky bowlder clay soil unfertilized for 7 years, and (4) a wet cultivated soil.

A comparison of the analyses of the soils and the corresponding soil waters showed that although the organic matter content in the first soil was higher than in the other three soils, the organic matter contents of the soil water of the other three soils were greater than in the water from the first soil. The second and third soils contained less potash than the first soil, but their soil water contained more than the water from the first soil. The derelict soil water also contained a higher percentage of iron than those from the three fertile soils.

It is concluded that the composition of the soil water is not that which would be inferred from chemical analysis of the soil.

Moisture studies at the Leffingwell Rancho, J. R. ALLISON (*Cal. Citrogr., 3 (1918), No. 12, pp. 290, 308, figs. 6*).—This article deals primarily with apparatus and methods used in making soil moisture studies. Data obtained are also reported, indicating that trees growing upon a heavy soil are quickly damaged by too liberal use of water. It is believed that it is often much better to have the available soil moisture somewhat below the theoretical optimum or moisture equivalent, preferably about 5 per cent above the wilting coefficient. This seems to be especially true of heavy soils which have the property of increasing in volume on becoming wet and contracting on drying.

Effect of soil alkali on plant growth, F. S. HARRIS (*Trans. Utah Acad. Sci., 1 (1908–1917), pp. 131, 132*).—This is a summary of the results of 18,000 determinations on the effect of alkali in the soil on the germination of seeds and the growth of plants.

It was found that only about one-half as much alkali was required to inhibit the growth of crops in sand as in loam. Crops varied greatly in their relative

resistance to alkali salts, the usual order of resistance being barley, oats, wheat, alfalfa, sugar beets, corn, and Canada field peas. Results from solution cultures and from soil tests did not agree in all cases. The period of germination of seeds was considerably lengthened by the presence of soluble salts in the soil.

The acid and not the basic radical apparently determines the toxicity of alkali salts in the soil, chlorid being the most toxic of the acid, and sodium the most toxic of the basic radicals. The injurious action of alkali salts was not always proportional to the osmotic pressure of the salts. The antagonistic effect of combined salts was not so great in soils as in solution cultures. Toxicity of alkali salts was influenced by the percentage of soil moisture. Salts added to the soil in solution had a greater effect than those added in the dry state.

**On nitrification: II, Intensive nitrite formation in solution**, A. Bonazzi (*Jour. Bact., 4 (1919), No. 1, pp. 43-60, pl. 1, figs. 2*).—This is the second of a series of articles on nitrification in soils contributed from the Ohio Experiment Station (E. S. R., 33, p. 421).

It was found that the ordinary Omelianski solution for the growth of the nitrite former will support a very abundant growth of this organism as measured by the production of nitrous acid. The conditions under which this luxuriant growth was produced were (1) shallow layers of the solution inclined at an angle of 5°, (2) slow rotary movement of the culture, and (3) a temperature of 25 to 30° C. The growths reported are considerably in excess of any yet reported for equal periods of time in solution cultures. "It would seem that better aeration may not be the only factor contributing to intensive nitrification, but that change of local environment is in some way associated with it."

**Nitrate production in soil as affected by the crop and cultivation**, W. A. Albrecht (*Missouri Sta. Bul. 163 (1919), pp. 67, 68*).—In studies of the influence of crops and cultivation on nitrate production in soils, it was found during the first year that "the most significant influence of the crops is that of removing the nitrates. A reduction of nitrates takes place when the crop makes its rapid growth. For corn, nitrates accumulated until late in June but decreased very decidedly thereafter. For the grasses, including oats and timothy sod, no significant accumulation ever occurred, although there was slight increase after the crops were harvested.

"Cultivation failed to have any significant favorable effect. The greatest accumulation was obtained in the plat which was plowed in the spring and scraped to remove the weeds. The next highest accumulation resulted where the soil was left entirely undisturbed save that the weeds were pulled by hand. No appreciable difference was given by plowing 4 in. deep as compared to plowing 8 in. deep. Plats left uncultivated were higher in nitrates than those cultivated regularly during the year.

"The straw mulch had a decidedly depressing effect on nitrate accumulation. No significant accumulations occurred. Apparently the high moisture was responsible, since the curve of moisture percentage bears a negative correlation to that of nitrate accumulation."

**A possible case of partial sterilization in soil**, F. Knowles (*Nature [London], 103 (1919), No. 2585, p. 205; abs. in Chem. Abs., 13 (1919), No. 15, p. 1736*).—A very favorable growth was observed in crops of potatoes, dwarf peas, and dwarf beans grown on a garden soil that had been idle for at least three years and that had received by chance a light top-dressing of a mixture of charcoal and brick earth impregnated with potassium carbonate and hexamethylenetetramin. It is suggested that the unusually good growth of the crops

may have been due to the liberation of formaldehyde by the hexamethylenetetramin through the action of dilute soil acids, which caused partial sterilization.

**The search for toxin producers**, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales, 43 (1918), pt. 1, pp. 142–190*).—Experiments to determine the origin of toxins in soils are reported in which certain soil bacteria, molds, and amœbæ, all reasonably supposed to be capable of furnishing substances of a toxic nature, were grown in various media and under varying conditions. In all cases, the signs of toxicity which became manifest could be attributed to an alteration in the reaction of the media.

"The test organism, *Bacillus prodigiosus*, grows best in a neutral medium, and an indicator is required which will indicate strict neutrality. The methyl-orange numbers are too high and the phenolphthalein too low. Small divergences from the neutral point strongly affect the growth. The humus of leaf-mold contains two types of humic acid; one absorbs alkali from alkaline carbonates, and the other from alkaline carbonates and hydrates. These were present to the extent of one part of the former to three of the latter. Heating the humus increases the amount of acid, and the increase is largely soluble in water. The effect of reaction is quite of a different order from the evidence of toxic action obtained in former researches."

**Unproductive soils**, L. GRIMALDI (*Le Terre Difficili. Casale Monferrato: Marescalchi Bros., 1917, pp. VIII+98*).—This pamphlet deals with the treatment and cultivation of acid peat and swamp soils, heather soils, sands, alkali soil, soils containing hardpan and mineral acids, siliceous and rocky soils, arid soils, and generally worn-out soils as they occur in Italy. A specially interesting feature is the dynamiting of rocky soils preliminary to cultivating.

**Timely soil topics**, F. E. BEAR, J. F. BARKER, F. A. BACHTELL, and R. B. DUSTMAN (*Columbus, Ohio: Authors, 1919, pp. 108, pls. 14*).—This volume is the outgrowth of a series of 4-page pamphlets written monthly during the year 1918–19 by members of the department of agricultural chemistry and soils of the Ohio State University, and consists of the material contained in the first thirteen numbers, revised and rearranged. It deals with the management of soils with reference to the production of common farm crops, taking up especially the varying uses of fertilizers on soils for different crops and the preparation of soils for different crops.

**Experiments to determine the best systems of soil management for the most important soil types in Missouri**, M. F. MILLER, F. L. DULEY, and B. W. TILLMAN (*Missouri Sta. Bul. 163 (1919), pp. 68–71, figs. 3*).—Experiments on 14 different fields are summarized.

As an average of all trials a ton of barnyard manure gave a crop increase valued at $4.20 at present crop values. As an average of all experiments the addition of 300 lbs. of steamed bone meal brought a return in four years of approximately $20 an acre. An addition of 400 lbs. of acid phosphate brought a return of about the same amount. Rock phosphate additions just about paid for their cost during a period of from 6 to 10 years. The return from a ton of ground limestone was approximately $8. Green manuring with cowpeas gave generally good results.

**Soil fertility experiments**, C. B. WILLIAMS (*North Carolina Sta. Rpt. 1918, pp. 23–28*).—This is a brief sketch of the plan of soil fertility experiments at different farms of the station, together with a statement of results so far obtained.

Among the more important results it was found that at the Iredell substation mineral nitrogenous fertilizers, sodium nitrate and ammonium sulphate,

have given better results than organic nitrogenous fertilizers, there being no marked residual effect of the latter. Finely ground rock phosphate was found not to be as economical a carrier of phosphoric acid as acid phosphate, in spite of the high price of the latter.

"In the study [at the Granville farm] of the value of different sources of nitrogen, phosphoric acid, and potash, and combinations of these for tobacco, results thus far secured indicate that the organic sources of nitrogen are best. Dried blood is probably best, with cottonseed meal next of the more common nitrogenous carriers. When mixed with proper proportions of phosphoric acid and potash, sulphate of potash produces a better quality of tobacco than does muriate of potash. The muriate, however, seems to make a larger leaf, or one with a larger spread. Acid phosphate has given better results as a carrier of phosphoric acid for tobacco than has either bone meal or basic slag. . . . The field experiments in the study of the value of tobacco stems and stalks for fertilizing tobacco have indicated that good tobacco can be grown by the use of these, when they are not used at a rate heavier than 2,500 lbs. per acre, supplemented with a little phosphoric acid and potash, if native or bright tobacco stems are used; and by phosphoric acid and nitrogen when Burley stem and stalks are applied. . . .

In the study [at the Reidsville farm] of the residual effect of fertilizers on small grains, generally wheat and then grass following after tobacco with no additional fertilizer, the residual effect of phosphates was dominant and very important. . . . Even when used with phosphate, the residual effect of materials carrying ammonia was not generally important for more than one year. The use of potash alone or combined with ammonia only had almost no residual effect."

**On the persistence of arsenite of soda in the soil**, C. W. Mally (*So. African Jour. Sci., 15 (1919), No. 5, pp. 325–329*).—Analyses of samples of stable manure treated with sugar and sodium arsenite as fly killer are reported, together with the results of plat experiments with wheat, oats, rye, barley, maize, peas, beans, potatoes, and cabbage, to determine the direct influence and residual effect of sodium arsenite prepared as fly bait and added at rates of 6.25, 12.5, 25, 50, 100, 200, 300, 400, and 500 lbs. per acre, and mixed in the same amounts with stable manure added at the rate of 10 tons per acre. The soil was a deep stiff clay.

The results showed that in the stronger plats (500, 400, and 300 lbs. per acre) the transplants, as well as the seedlings of all kinds, presented a very sickly, spindly appearance from the start, being stunted in growth and of a reddish-yellow color, especially at the tips and along the edges of the leaves. On the whole, the sickly appearance was less pronounced from plat to plat as the strength of the arsenite decreased, but there was not much choice between the 500, 400, and 300 lb. plats. In the 200-lb. plat the injury was less severe, and in the 100-lb. plat only noticeable. In the weaker strengths no injury was manifest in comparison with the control and the isolation plats.

The manured plats were better than the unmanured plats. The manured part of the control plat was better than any of the others, including the isolation plats, which received neither manure nor poison. The manure in the poisoned plats clearly counteracted the effect of the poison to some extent.

"The injurious effect of the arsenic was most noticeable during June and July, while the different plants were young. Of the grain crops, severity of injury was apparent in the order named: Oats, barley, wheat, and rye. Oats were very sensitive, and would make a valuable 'indicator' of arsenical poison in the soil. Barley followed it very closely. Wheat was considerably less

sensitive than oats or barley. Rye showed a considerable degree of resistance, so much that it would be of little use as an indicator, but this fact establishes its value as a crop to be grown when arsenical soil poisoning is suspected. Peas were much more sensitive than beans—in fact, peas would also serve as a good indicator of arsenical soil-poisoning. Although the other crops showed the effect of the poison, they were not specially sensitive, and were so irregular that no close comparisons could be made. As the rains diminished and the season advanced into spring and summer, all of the plants made more rapid progress. . . .

"The plats were continued through 1916, 1917, and 1918, with the same crops as indicators. The results are in the same order, but distinctly less marked each succeeding season. During the present season (June, 1918) the effect of the arsenic in the stronger plats can still be traced in oats and barley, but it is doubtful whether it will show to any extent as the crops approach maturity.

"In the experimental plats, amounts of arsenic far in excess of any possible bait accumulations in the manure did not have a noticeable effect on the crops grown. It therefore seems justifiable . . . to conclude that farmers have nothing whatever to fear from the small amount of arsenite of soda in the form of house-fly bait that may accumulate in stable manure."

**Liquid manure** (*Jour. Bd. Agr. [London], 26 (1919), No. 4, pp. 428–431*).—Notes are given on the value and use of liquid manure, it being emphasized that the more liquid manure is kept from the air the better will it retain its fertilizing value, and that in storage of liquid manure no solid manure should accompany the liquid into the tank, owing to the resulting fermentation and loss of value.

**Fertilizers and their use in Canada**, F. T. Shutt (*Canad. Thresherman and Farmer, 24 (1919), Nos. 8, pp. 28–31; 9, pp. 40–42, figs. 2*).—The author reviews and summarizes the results of recent years' fertilizer experiments in Canada, which indicate that in most cases excessively large dressings of fertilizer have not given net profits per acre of the same magnitude as medium applications. The larger profits came from using complete fertilizers. In general, it was found that the exclusive use of fertilizers will neither maintain the fertility of the soil nor yield profitable returns, and that it is on soils of medium quality rather than on soils of poor quality that profitable returns can be expected. Furthermore, the use of fertilizer on so-called "money" crops yielded the greatest profit.

**Fertilizers and fertilizing**, R. Heinrich (*Dünger und Düngen. Berlin: Paul Parey, 1918, pp. VII+158*).—This book is intended as a guide for the practical use of stable and green manure and commercial fertilizers in Germany.

**Home mixing of fertilizers**, C. C. Fletcher (*U. S. Dept. Agr. Yearbook 1918, pp. 185–190, fig. 1*).—This is a brief popular description of the process of mixing fertilizers at home.

**The effect of different amounts and different methods of applying commercial fertilizer to the corn crop**, M. F. Miller and F. L. Duley (*Missouri Sta. Bul. 163 (1919), p. 67*).—As an average of two years' trials it was found that when the weather is dry the addition of fertilizers in the row produced poorer results than addition with the fertilizer drill in advance of the corn planter. "The early effects of the row fertilization are more marked than the early effects of the fertilizer applied over the whole surface, but corn so fertilized does not seem to be able to stand the drought so well during July and August because of the larger leaf development. Fertilizer applied as a side application along the row at the second or third cultivation has brought fairly good increases as an average of these two years."

**The fertilizing value of activated sludge**, G. G. NASMITH and G. P. MCKAY (*Jour. Indus. and Engin. Chem., 10 (1918), No. 5, pp. 339–344, figs. 7; abs. in Engin. and Contract., 50 (1918), No. 2, pp. 31, 32*).—Experiments are reported in which air-dried sludge was compared with air-dried stable manure as a fertilizer for radishes, lettuce, beans, beets, late radishes, tomatoes, carrots, and onions on a poor clay soil low in organic matter. Both sludge and manure were added at the rate of 14.5 tons per acre. Under the rather limited conditions of the experiment it was found that the activated sludge in general gave much better results than the manure.

"From the results obtained it seems to be true that crops such as lettuce, . . . beans, beets, or tomatoes, . . . can be stimulated into very heavy growth by the use of activated sludge. The increase in the yield of onions is also great. . . . In the case of radishes, though the final weight was not materially greater, the radishes matured much more rapidly. . . . The same holds good of lettuce or beets, in which the growth was much more rapid than it was with the other fertilizer tested."

**Government Guano Islands**, W. R. ZEEDERBERG (*Union So. Africa Dept. Agr. Rpt. 1917–18, pp. 149–153*).—This report states that the Government Guano Islands of the Union of South Africa yielded from all sources 6,965.5 tons of guano in 1917. Data on distribution and use are given. The average chemical composition of the guano disposed of during 1917 was nitrogen, 11.06 per cent; water-soluble phosphoric oxid, 3.5; citrate soluble phosphoric oxid, 11.41; total phosphoric oxid, 11.46; potash, 2,5; and lime, 11.62 per cent.

**The relative availability of nitrate nitrogen and commercial organic nitrogen in cylinder and field experiments**, A. W. BLAIR (*Amer. Fert., 51 (1919), No. 6, pp. 56, 57*).—The results of 20 years' cylinder and field experiments at the New Jersey Experiment Stations are reported on the relative availability of nitrate nitrogen and nitrogen from organic sources.

Two types of loam soil and a loam with varying admixtures of coarse white sand were used. For all of these soils, except those containing 80 per cent or more of sand, the nitrates gave better yields and showed a higher percentage of nitrogen recovered in the crop than the organic materials such as dried blood, fish, and tankage. "Under the most favorable conditions only a little over 60 per cent of the applied nitrogen can be recovered in the crop. . . . Under less favorable conditions, the percentage recovery is much lower, often amounting to only one-third of the amount applied." In the cylinder experiments only about 38 to 45 per cent of the applied organic nitrogen was recovered. The average recovery of nitrate nitrogen in the field experiments was 37 per cent and of organic nitrogen 26.5 per cent. It is suggested that the superiority of nitrate nitrogen is due to its immediate availability. See also a previous note (E. S. R., 41, p. 22).

**The manufacture of ammonia for fertilizer salts**, C. BOSCH (*Ztschr. Elektrochem., 24 (1918), No. 23–24, pp. 361–369*).—This is a review of work in Germany during the year 1918 on the synthesis of ammonia, with special reference to use as fertilizer material.

**Potassium ammonium nitrate, a new top-dressing for sugar beets**, M. HOFFMANN (*Deut. Zuckerindus., 43 (1918), pp. 149, 150; abs. in Ztschr. Angew. Chem., 31 (1918), No. 84, Ref., p. 313; Jour. Soc. Chem. Indus., 37 (1918), No. 23, p. 744A*).—Potassium ammonium nitrate, prepared from ammonium nitrate and potassium chlorid, has been found to be easy to distribute over the land and can be safely used as a top-dressing. It contains about 13 per cent of nitrogen, 25 per cent of potash, and from 27 to 30 per cent of chlorin. It has

the advantage over ammonium nitrate that it can be spread more uniformly and is much less hygroscopic and explosive.

Economic analysis of the world shortage in phosphate, L. B. ANDERSON (*Amer. Fert., 51 (1919), No. 7, pp. 47–59, figs. 4*).—In this analysis and summary of the world's phosphate industry, data are reported indicating that the total world shortage in phosphate production occasioned by the war amounts to about 15,000,000 tons. This country contains the greatest known phosphate deposits and is the largest producer of natural phosphate, but the phosphate export business which it was unable to do during the war was about 5,000,000 tons. Basic slag production did not increase rapidly enough to offset the shortage in phosphate, and Tunis now exports more phosphate than the United States.

"The Special Commission to Europe reports a big demand for fertilizer. Ocean tonnage is the principal factor tending to retard the development of the business at the present time. The policy of the Shipping Board will be to meet foreign rates, and develop the business in so far as it can be consistently done. The present methods of selling phosphate are very favorable to the American exporter as contrasted with prewar methods. Europe must import phosphate in large quantities if the original productivity of the soil is to be restored. The United States, owing to her splendid deposits, is in a good position to develop this business when normal conditions again prevail."

The mineral superphosphate industry, E. STAUB (*Chim. et Indus. [Paris], 2 (1919), No. 2, pp. 123–132, figs. 8; abs. in Chem. Abs., 13 (1919), No. 10, pp. 1115, 1116*).—This is a review of the process used in the manufacture of superphosphate and also of various other processes that have been proposed for treating phosphate rock, including (1) digestion with sodium acid sulphate, (2) ignition with silica and an alkali salt to form artificial slags, (3) manufacture of tetraphosphate, and (4) manufacture of double superphosphate by treatment with acids.

Artificial phosphatic slag, A. BRUNO and L. RONNET (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 20, pp. 592–594; abs. in Chem. Abs., 13 (1919), No. 17, p. 2102*).—This is a brief description of an artificial phosphatic slag manufactured from phonolite rock by the Germans during their occupation of Belgium. An analysis shows total phosphoric acid 11.5, citrate soluble phosphoric acid 6.5, potash soluble in strong acid 2.4, and in weak acid 1.07 per cent. The use of this slag on sandy soils is recommended especially for potatoes, although it is the opinion that phonolite was chosen for this material on account of its ease of vitrification rather than for its potash content.

Determination of the relative value of different forms of phosphorus upon the soil at Columbia, M. F. MILLER and F. L. DULEY (*Missouri Sta. Bul. 163 (1919), p. 67*).—Comparative trials of rock phosphate, acid phosphate, bone meal, basic slag, and calcined phosphate, on wheat in plats showed that respective average increases of 2.3, 3, 7.5, 3.8, and 5.5 bu. per acre were obtained. The results with calcined phosphate, which is a heat treated rock phosphate, are considered specially promising.

Future of the potash industry, J. W. TURRENTINE (*Chem. and Metall. Engin., 20 (1919), No. 7, pp. 310, 311; abs. in Chem. Abs., 13 (1919), No. 10, p. 1129*).—This is a plea for scientific organization and cooperation in the development of American potash.

American potash in crop production, E. O. FIPPIN (*Cornell Countryman, 16 (1919), No. 3, pp. 121, 122, 140, 142, 144, fig. 1*).—The author summarizes data from different sources to indicate the importance of potash as a fertilizer, and draws attention especially to the reduction in crop yields due to the recent scarcity of potash. "It can be expected that potash will come back into com-

mercial fertilizer, but in more conservative amounts than was formerly used for the ordinary farm crop."

**Potash recovery**, N. H. GELLERT (*Chem. and Metall. Engin., 20 (1919), No. 7, pp. 308, 309; abs. in Chem. Abs., 13 (1919), No. 10, p. 1129*).—A comparison is made of data reported by others, and estimates are given of the cost of operating the Cottrell system for the removal of the dust from blast furnace gases. It is considered that the net revenue derived from the potash that is recovered in the dust should yield profitable returns even if the price of the potash were to drop to a value of $1 per unit.

**Value of blast furnace dust as a potash manure: Report on field trials** (*Jour. Bd. Agr. [London], 26 (1919), No. 4, pp. 387–396*).—Plat experiments with potatoes and mangolds to compare low-grade dust, medium-grade dust, high-grade dust, extracted dust, and German potassium sulphate containing respectively 2.21, 5.85, 8.9, 7.37, and 50.24 per cent potash as sources of potash are reported. The fertilizers were added at respective approximate rates of 2,200, 850, 550, 650, and 100 lbs. per acre.

It was found that the extracted and high-grade dusts gave the best results with potatoes, followed by the medium-grade dust and the potassium sulphate. The low-grade dust gave the poorest results. It is noted that the extracted dust, that is, dust very rich in potash from which the bulk of the water-soluble potash had been removed by boiling water, gave among the highest results. It was found to be advisable to add the dust well in advance of the crop owing to the relatively low availability of the potash.

The results obtained with mangolds did not correspond with those obtained with potatoes. Potassium sulphate gave the best results, while the poorest were with low-grade dust and late additions of medium-grade dust. The rest of the dusts gave about equal results in all cases, with about a 10 per cent increase in yield.

**Fertilizer from the effluent from potassium chlorid works**, W. HÜTTNER (*Chem. Ztg., 42 (1918), pp. 434, 435; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 21, p. 666A; Chem. Abs., 13 (1919), No. 9, p. 985*).—In the process of manufacture of fertilizer from the effluent of potassium chlorid works the effluent is introduced into a tank containing quicklime, the latter being covered with the liquid. Heat is developed and the whole is converted into a powdery mass which consists of magnesium oxid, magnesium and calcium oxychlorids and small quantities of potassium chlorid, sodium chlorid, calcium sulphate, etc. The fertilizing value of this material is said to depend chiefly upon the presence of the magnesium oxid.

**Bracken as a source of potash**, J. E. PURVIS (*Proc. Cambridge Phil. Soc., 19 (1919), No. 5, pp. 261, 262; abs. in Chem. Abs., 13 (1919), No. 15, pp. 1736, 1737*).—The percentage of potash in samples of bracken collected at Cambridge during different months of the year ranged in the dry material from 3 per cent in that collected in June to 0.82 per cent in the samples collected in October. In Welsh bracken the corresponding range of the potash was from 3.22 per cent to 1.32 per cent as found in the samples collected in July and October, respectively.

These results are considered to confirm the opinion that in the summer months there is more potash than in the later months. "Also there is a clear indication that, on an average, the Welsh peaty soil yields more potash than the Cambridge poor sandy soil."

**Bracken: Utilization and eradication**, R. A. BERRY (*West of Scot. Agr. Col. Ann. Rpt., 14 (1917), pp. 181–193*).—Studies on bracken with particular reference to its value as a source of potash are reported.

It was found that "the composition of bracken depends mainly upon the age of the fronds, and, to a less extent, on varying soil and climatic conditions. The ash in the dry matter amounts to about 9 per cent, and contains 55 per cent of potash in the young fronds, and to about 6 per cent and 40 per cent, respectively, in the mature fronds. The rate of fall varies according to soil and climatic conditions.

"The potash in the ash is present largely as the sulphate and the chlorid of potassium. Some carbonate is also present. Over 90 per cent of the total potash, in carefully prepared ash, is soluble in water. By extracting the dry matter with water, more than 90 per cent of the total potash in the form of neutral salts is dissolved out, a fact which will largely account for the very low potash content of ash made from dead bracken, cut in the winter months after exposure to the leaching action of rain. Age of the plant does not affect the solubility of the potash.

"The caustic nature of the ash can be destroyed by the addition, in a fine state of division, of acid salts such as superphosphate of lime, or niter cake (sodium hydrogen sulphate). In the making of the ash, too large a fire should not be kept burning, otherwise a very high temperature may be attained, which might cause some loss by volatilization of potassium in the form of the chlorid, and also fusion of the ash into solid lumps. The best time to cut the bracken to secure the greatest yield of potash is when the fronds have reached their maximum growth, a development indicated by the withering of some of the small leaves and when the green color of the stem begins to change. The date will vary according to season and local conditions. Under the best conditions of cutting, drying, and burning, it requires from 4 to about 8 acres—according to the density of growth and height of the fronds—of fully stocked bracken land to yield 1 ton of ash."

Commercial fertilizers, E. G. Proulx, O. S. Roberts, R. O. Bitler, S. F. Thornton, and O. W. Ford (*Indiana Sta. Bul. 229 (1919), pp. 3–94, figs. 4*).—This bulletin presents the results of analyses and valuations of 1,285 samples of fertilizers and fertilizing materials collected for inspection in Indiana during 1918.

It was found that 69.1 per cent of the samples were equal to the guaranty in every particular, and that 88.9 per cent were equal to the value of the guaranty. The former figure is the highest yet attained in the State while the latter is slightly lower than that of the previous year.

"The largest number of samples having a deficiency of 10 per cent or more of guaranty were in potash, there being 130 inspection samples found deficient in potash, or more than the deficiencies in nitrogen, available phosphoric acid, and total phosphoric acid combined. . . . In nitrogen 28 samples were deficient 10 per cent or more of the guaranty; in available phosphoric acid, 42 samples; and in total phosphoric acid, 21 samples."

Digest and copy of fertilizer law (*New Jersey Stas. Circ. 108 (1919), pp. 8*).—This is a revision of Circular 9 of the station (E. S. R., 28, p. 326) including the amendments to the law passed in 1919.

## AGRICULTURAL BOTANY.

[Report of the investigation and work in plant physiology], R. P. Hibbard (*Michigan Sta. Rpt. 1918, pp. 271–273*).—A brief outline is given of the work carried on in the department of plant physiology, the principal investigation being a continuation of that previously reported (E. S. R., 39, p. 419). An account is given of investigations of the soil solution, this work having been con-

tinued in experiments conducted in quartz and soil. The three series that have been made are believed to have established the physiological balance in soil cultures.

Porous clay cones for the auto-irrigation of potted plants, B. E. Livingston (*Plant World, 21 (1918), No. 8, pp. 202-208, fig. 1*).—An account is given of the construction, operation, and advantages of a plan for auto-irrigation in the study of plants.

A comparison of permeability in plant and animal cells, W. J. V. Osterhout (*Jour. Gen. Physiol., 1 (1919), No. 4, pp. 409-413*).—Disks of Laminaria were studied in connection with comparable pieces of skin taken from the frog (*Rana pipiens*). The quantitative results showed a striking agreement between the two kinds of tissues as regards certain important aspects of permeability, antagonism, injury, recovery, and death.

Decrease of permeability and antagonistic effects caused by bile salts, W. J. V. Osterhout (*Jour. Gen. Physiol., 1 (1919), No. 4, pp. 405-408, figs. 2*).—As a result of experiments made by determining the electrical conductivity of Laminaria in solutions to which sodium taurocholate had been added, the author states that this salt decreases permeability and antagonizes sodium chlorid. This fact confirms the hypothesis that antagonistic relations can be predicted from studies on permeability.

Antagonism between alkaloids and salts in relation to permeability, W. J. V. Osterhout (*Jour. Gen. Physiol., 1 (1919), No. 5, pp. 515-519, figs. 3*).—In order to compare antagonism between alkaloids and salts with that between salts and other salts, the author carried out experiments on Laminaria with nicotin, caffein, and cevadin added in varying amounts to sodium chlorid at 0.52 M.

It appears that solutions which have opposite effects on permeability antagonize each other in case of alkaloids as well as in that of salts. It also appears from this work that certain alkaloids which decrease permeability are able to antagonize sodium chlorid, in this respect resembling salts which decrease permeability.

The effect of ions of sodium chlorid and calcium chlorid upon the electrical conductivity of certain colloidal mixtures, N. B. Green (*Plant World, 21 (1918), No. 12, pp. 303-316, figs. 7*).—Experiments here outlined were suggested by the discovery of Osterhout (E. S. R., 26, p. 823) that the permeability of plant tissues to various ions can be determined by measuring the resistance offered by such tissues to an electric current. It was found in the present work that when one salt is allowed to penetrate the colloid for a time, and then a second salt substituted, the rate of penetration by the ions of the latter seems to be unaffected by the presence of the former. The mixed solution of sodium chlorid and calcium chlorid showed a fall of resistance similar to that of either of the constituents alone, the curve approaching more nearly that of the predominant salt. Ions of these two substances do not antagonize one another as regards penetration of certain colloidal gels, notably gelatin or mixtures of gelatin, agar, and whole wheat flour.

Determinations of electrical resistance in solutions of gelatin to which salts had been added in varying concentrations showed that the electrical resistance of the gelatin varies directly with the precipitability, which is greatest at the isoelectric point, that is, where the unadsorbed + and − ions of the added salts balance one another.

The water requirement of plants as influenced by environment, L. J. Briggs and H. L. Shantz (*Proc. 2. Pan Amer. Sci. Cong., 1915-16, vol. 3, pp. 95-107, pls. 2, figs. 4*).—From experiments with grain and other plants, described as

employing methods somewhat different from those previously used (E. S. R., 32, p. 127), the authors claim that where the crop is thoroughly adapted to the region in which it is grown the water requirement approaches its minimum, but is relatively high when the crop is not well adapted. Water requirement is not correlated with any one condition of the environment. Cool weather crops as a rule will have a low water requirement in cool seasons and a high water requirement in warm seasons. In case of warm-weather crops the reverse is usually true, although the effect is less marked, a cool season being conducive to a low evaporation rate.

**On the osmotic concentration of the tissue fluids of desert Loranthaceæ,** J. A. HARRIS (*Mem. Torrey Bot. Club, 17 (1918), pp. 307–315*).—Having continued previous work (E. S. R., 37, p. 47), the author here presents results of studies on sap concentration of the tissue fluids of desert mistletoes and that of their hosts for comparison with those for the rain forest series already noted. The investigation included *Phoradendron coryæ, P. macrophyllum,* and *P. californicum* on a number of hosts.

The osmotic pressure of these mistletoes was, roughly speaking, twice as great as was found in the Blue Mountains of Jamaica. In desert Loranthaceæ, as in those of the montane rain forest, the osmotic concentration of tissue fluids was generally, but not invariably, higher than that of the host.

**The effect of soaking in water and of aeration on the growth of Zea mays,** F. M. ANDREWS and C. C. BEALS (*Bul. Torrey Bot. Club, 46 (1919), No. 3, pp. 91–100, figs. 5*).—In this work it was found that 12 hours is the optimum period of soaking seed of *Z. mays* in order to obtain increased growth, and that growth is retarded temporarily by too long a period of soaking. Puncturing or partially removing the seed coats accelerates germination. Aerating the culture solution accelerates growth.

**Comparative studies on respiration.—VI, Increased production of carbon dioxid accompanied by decrease of acidity,** M. IRWIN (*Jour. Gen. Physiol., 1 (1919), No. 4, pp. 399–403, figs. 2*).—Having noted that high concentrations of ether greatly increased carbon dioxid production by animals, and that this is associated with irreversible changes ending in death, the author, in order to obtain light on the question arising as to whether this increased evolution of carbon dioxid might not indicate increased respiration, experimented with two organisms, *Salvia involucrata* and *S. splendens,* in which death is not accompanied by increase of acidity. It was found that in petals of Salvia high ether concentrations increased oxygen consumption and carbon dioxid production, a decrease occurring at the same time in the acidity of the cell content.

**On the decomposition of cellulose by an aerobic organism (Spirochæta cytophaga n. sp.),** H. B. HUTCHINSON and J. CLAYTON (*Jour. Agr. Sci. [England], 9 (1919), No. 2, pp. 143–173, pls. 3, fig. 1*).—An account is given of the study of an organism found in the Rothamsted soils which is able to break down cellulose with comparative ease and which presents features of morphological and physiological interest. The organism, which is said to be more closely allied to the Spirochætoideæ than with the bacteria, is named *Spirochæta cytophaga.* It does not grow in the usual way on nutrient gelatin or on agar. Cellulose is the only carbon compound found to favor its growth. Evidence is adduced to show the relation of cellulose decomposition to the assimilation of atmospheric nitrogen.

**Influence of temperature and hydrogen ion concentration upon the spore cycle of Bacillus subtilis,** A. ITANO and J. NEILL (*Jour. Gen. Physiol., 1 (1919), No. 4, pp. 421–428, figs. 2*).—Data resulting from this investigation are given with discussion. Automatic adjustment of the medium seems to play a rôle in

the completion of the spore cycle of *B. subtilis*. The results are thought to be capable of practical application in the preservation of food by canning and other methods.

[Viability of Pseudomonas radicicola under aerobic and partial anaerobic conditions], F. O. Ockerblad (*Michigan Sta. Rpt. 1918, pp. 255–264*).—On account of the practice of experiment stations and commercial firms of distributing cultures of nodule-forming bacteria in liquid media, the author conducted a series of experiments with 12 strains of *P. radicicola* under various conditions to determine their effect on the viability of the organisms. Liquid and solid cultures were inoculated with a suspension of bacteria and incubated for two weeks at temperatures of 20 to 23° C. The containers holding one-half of each lot were plugged with cotton and the others with cork stoppers.

Examinations of the organisms were made from time to time, and it was found that the cultures in cork-stopped bottles died quite rapidly. The organisms living after 160 days averaged 0.21 per cent for the liquid and 3 per cent for the solid cultures. The viability of the organisms in ash-sugar solution was much less than that on ash-sugar agar. On the ash-sugar agar under cotton plugs the different strains died gradually, an average of 91.1 per cent living after 20 days, 46.2 per cent after 100 days, and 12.5 per cent after 160 days. The thermal death point of different strains was determined to fall between 59 and 61°. Four of the 12 organisms were found to stand a temperature of 60°, but none of them was able to grow after being exposed for 10 minutes at a temperature of 61°.

The factors considered to cause a decrease in the number of living organisms are partial anaerobic conditions, accumulation of metabolic and toxic products, and plasmolysis caused by the concentration of the ash-sugar solution through evaporation. In the case of the unsealed liquid cultures, it is believed that the partial anaerobic condition in the medium was a factor in the decreased number of living bacteria. With the sealed cultures of both media, the partial anaerobic conditions, which tended to become wholly anaerobic, are considered the principal cause of the dying off of the bacteria.

Prussic acid in Burma beans, E. J. Warth and K. K. Gyi (*Agr. Research Inst. Pusa Bul. 79 (1918), pp. 11*).—The results of studies carried out to date with local (Burmese) varieties of *Phaseolus lunatus* as to their content of hydrocyanic acid are said to show that, while the amount present in the cultures varies considerably with soil and climatic conditions, cultures giving low percentages in one locality give low figures under all conditions tested. Hydrocyanic acid content thus appears to be an inherited character in pure single plant cultures. Differences in the color of seeds from a single culture do not indicate corresponding probable differences in the hydrocyanic acid content of the progeny. While the best cultures thus far found contain some of this poison, the quantity now obtained is only half that contained in the original sample of Madagascar bean which was regarded as safe and introduced into the Province.

A fern having hydrocyanic acid, M. Mirande (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 19, pp. 695, 696*).—The author has found that *Cystopteris alpina* (*C. fragilis alpina*) contains hydrocyanic acid in the green parts (fronds). The process of separating the acid is briefly described.

Notes on dune vegetation at San Francisco, Cal., F. Ramaley (*Plant World, 21 (1918), No. 8, pp. 191–201, figs. 4*).—A description is given of the forms of vegetation on the sand dunes of Golden Gate Park as noted on exposed points, protected areas, and low places. Plant associations are noted. A systematic list is given, containing 40 native and 8 introduced species.

**Root habit and plant distribution in the far North**, H. E. PULLING (*Plant World, 21 (1918), No. 9, pp. 223–233, fig. 1*).—The author, classifying root systems, regards black spruce, tamarack, and canoe birch as being of rigid shallow habit; white spruce as of flexible shallow root habit; balsam poplar as of deep, flexible root habit; and jack pine and white pine as of deep, rigid root habit. Other differences which are discussed are omitted from the classification as having no apparent bearing on forest composition in the far North.

**Acclimatization of plants originally of hot climates**, G. ROSTER (*Agr. Colon. [Italy], 12 (1918), No. 4, pp. 231–254, fig. 1*).—Using the term acclimatization (as opposed to naturalization) of plants, as involving the multiform agencies employed by man, the author gives an account of some adaptations that have been accomplished.

**Ends and methods of acclimatization**, D. LANZA (*Agr. Colon. [Italy], 13 (1919), No. 1, pp. 1–15*).—This is largely a discussion of the contribution of Roster, above noted.

**Climax formations**, F. E. CLEMENTS (*Carnegie Inst. Wash. Year Book, 17 (1918), pp. 294, 295*).—Much attention has been paid to climax formations and their successional development, principally to the formations of widest extent, such as grassland, sagebrush, mesquite, and chaparral. As a consequence of work done in this connection, it has been possible to recognize and delimit the various associations of the nine climaxes for the first time and to point out their relationships to each other, as well as to the associations of adjacent formations; also to draw more definite distinctions between climax and successional indicators and to apply this to practical problems in grazing and forestry.

**Mutations in the jimson weed**, A. F. BLAKESLEE and B. T. AVERY, JR. (*Jour. Heredity, 10 (1919), No. 3, pp. 111–120, figs. 11*).—Continuing former studies (E. S. R., 37, p. 831), the authors have obtained evidence indicating the presence of another (third) pair of factors for the jimson weed (*Datura stramonium*). A possible fourth factor is under investigation.

In addition to this a study has been made of a number of mutative variants of greater or less distinctiveness which appear to be inherited in a manner not conforming to the Mendelian plan. A few of the more marked types of these are discussed herein. They seem to transmit their distinguishing characters as a complex, usually to a part only of their offspring, chiefly through the female side.

In one instance a mutation has arisen which seems to have established a distinct race or new species, breeding true but seemingly unable to cross with the parent species.

**Œnothera rubrinervis, a half mutant**, H. DE VRIES (*Bot. Gaz., 67 (1919), No. 1, pp. 1–26*).—Reporting, with discussion of facts and bearings, a study of *Œ. rubrinervis*, its origin and descendants, and some characters of the latter, the author states that *Œ. rubrinervis* is a half mutant, produced by the copulation of a mutated gamete with a normal *velutina* gamete of *Œ. lamarckiana*. In consequence of this origin it produces about one-fourth empty seeds, one-half *Œ. rubrinervis* which will repeat the splitting, and a mass mutation, amounting to about one-fourth of a pure or double mutant, which has been named *deserens* and which is constant from seed and has no empty grains as hereditary features. *Œ. rubrinervis* is not known to mutate otherwise to any noticeable degree, from which it is inferred that the internal constitution causing the mass mutation is not in itself the cause for further mutability.

Crosses of *Œ. rubrinervis* with *Œ. lamarckiana* give three types of hybrids, about one-fourth of the seeds being empty. One constant type resembles *Œ.*

*lamarckiana*, a second is named *lucida*, and the third is either *subrobusta* or *rubrinervis*. These behave in ways which are supposedly explained on the supposition that *Œ. rubrinervis* is a half mutant. *Œ. oblonga* is analogous to *Œ. rubrinervis* in some respects. *Œ. nanella* seems to arise through mutations in the *velutina* gametes of *Œ. lamarckiana*.

**The history of Primula malacoides under cultivation**, A. W. Hill (*Jour. Genetics, 7 (1918), No. 3, pp. 193–198, pls. 2, fig. 1*).—A brief account is given of the history of *P. malacoides* since its discovery in 1884 in cultivated fields at Ta-li, Yunnan, China. It is said to have displayed a considerable range of variation during this period, which is short as compared with the time taken to produce the variations which have been observed to occur in *P. sinensis* and *P. obconica*.

**Axillary cleistogenes in some American grasses**, A. Chase (*Amer. Jour. Bot., 5 (1918), No. 5, pp. 254–258, figs. 5*).—As a result of her study of the production of cleistogamous grains by a number of grasses, the author states that the axiliary cleistogenes and the chasmogenes (normal spikelets) produced by the same plant are so unlike that they would not, if their source were unknown, be placed in the same tribe. The cleistogenes are found to be more variable than are the chasmogenes of the same species. The author is inclined to think, from the many cases found by relatively little study, that the cleistogamous habit is not rare among the grasses.

**Plant introduction opportunities open to all the Americas**, D. Fairchild (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 503–510, pl. 1*).—This is a consideration of the possibilities of plant exchange between countries.

## FIELD CROPS.

**The experimental error in field trials**, H. H. Love (*Jour. Amer. Soc. Agron., 11 (1919), No. 5, pp. 212–216*).—In this paper, a contribution from the New York Cornell Experiment Station, the author offers a critical discussion of certain features of Kiesselbach's work on the elimination of experimental error in crop tests, previously noted (E. S. R., 39, p. 829). The points considered include observations on competition between rows and the conclusions reached regarding the use of the probable error in interpreting results.

**The effect of "place" on yield of crops**, F. J. Chittenden (*Jour. Roy. Hort. Soc., 44 (1919), pp. 72–74, pls. 2*).—Observations on some experimental plats at Wisley are held to indicate that place is an important factor in the yield of potatoes and should receive careful consideration when making comparisons between yields on different plats.

Up-to-Date potatoes were planted in 8 pairs of plats, each plat having three rows of potatoes equal distances apart and each row containing 18 plants equally distributed. The plats were so arranged that the outer row was separated 4 or 5 ft. from the outer row of the next plat and the pair of plats separated at the ends, so that the plants at the ends of the two inner rows had an additional exposure on one side and the end plant of the outer row a greater exposure on two sides than the other plants in their respective rows.

Based on the total yield of the outer row as 100, the average results for the three rows on all plats was as 100 : 72 : 72. The yield of the end plats of all rows compared with the average yield of other plants in the same rows was as 100 : 82. The average yield of the corner plants referred to above was as 100 : 66 when compared with the other end plants, as 100 : 79 when compared with the other plants in the outer row, and as 100 : 57 when compared with the inner plants. It is concluded, therefore, that the most advantageous place is at

the corner, the next best location in the outer row, the next at the end of an inner row, and the least desirable in the inner row.

**The improvement of agricultural crops by selection and hybridization** (*Scot. Jour. Agr., 2 (1918), No. 1, pp. 19–30*).—This comprises an account of an address delivered by T. Anderson before the Glasgow and West of Scotland Agricultural Discussion Society on the systematic improvement of crops in Scotland.

**Further observations on the practical value of line selection as compared with mixed populations in field crops,** L. Koch (*Tijdschrift, 29 (1918), No. 7, pp. 389–423*).—This supplements work previously noted (E. S. R., 40, p. 623), including observations on pure line selections of rice and peanuts, mixed populations of rice, hybrid strains of corn, and clonal divisions of sweet potatoes and cassava.

**A study of the relation of some morphological characters to lodging in cereals,** R. J. Garber and P. J. Olson (*Jour. Amer. Soc. Agron., 11 (1919), No. 5, pp. 173–186, pl. 1, figs. 2*).—This paper, a contribution from the Minnesota Experiment Station, describes investigations begun in 1916 to discover some simple morphological character closely correlated with lodging or nonlodging in cereals. For this purpose 15 strains of barley, 7 of oats, 2 each of spring and winter wheat, and Minnesota No. 2 winter rye, representing extreme lodging and nonlodging forms, were selected and most of the material grown both in the field and in the greenhouse. Observations were made on the correlation between lodging behavior and the average size of culm, the average number of vascular bundles, the average area of sclerenchyma, the thickness of the culm wall, the length of the lignified cells, and the thickness of the lignified cell walls. Data are presented showing the percentage and degree of lodging, the yield, and the height of the different varieties grown in the field, while data relative to the morphological characters of each sort are presented for both the field and greenhouse environment.

It is stated that none of the morphological characters studied except thickness of cell wall appeared to be closely related to lodging. Both the early and medium oat strains examined were found to show a distinct correlation between the thickness of the lignified cell walls and lodging. In general, lodging in cereals is said to be dependent upon so many factors of unequal value in the different sorts that no single factor seems to be closely enough correlated with it to be of much value as a selection index in cereal improvement. Among the different strains of oats and barley, the average number of vascular bundles was found to be correlated with the average diameter of the culms.

**The farmer and Federal grain supervision,** R. H. Brown (*U. S. Dept. Agr. Yearbook 1918, pp. 335–346, pls. 4*).—The advantages and method of grading grain at country points according to the Federal standards are described, as is also the subsequent handling of the wheat. Tabulated statements are included showing the standards for shelled corn, wheat, and oats.

**[Report of field crops work in Michigan, 1918],** J. F. Cox (*Michigan Sta. Rpt. 1918, pp. 253–255, 257, 288*).—This comprises a brief description of progress in work previously noted (E. S. R., 39, p. 335), including a short account of plant-breeding work by F. A. Spragg.

A report by B. W. Householder on variety and cultural tests with barley, oats, potatoes, and root and silage crops, made at the Upper Peninsula substation, has been noted elsewhere (E. S. R., 40, p. 731).

**[Report of field crops work in Missouri, 1917–18],** W. C. Etheridge, C. A. Helm, J. B. Smith, E. M. McDonald, L. J. Stadler, and J. T. Rosa, jr. (*Missouri Sta. Bul. 163 (1919), pp. 43–50, 58, fig. 1*).—This describes the continua-

tion of work previously noted (E. S. R., 38, p. 632), embracing variety and cultural tests with soy beans, cowpeas, cotton, corn, grain sorghums, oats, wheat, and barley, together with field tests of various forage crops, and a comparison of northern-grown with home-grown seed potatoes.

A mixture of oats and Canada field peas, with a yield of 3.1 tons of cured forage per acre, gave the best results among spring-sown forage crops tested at Columbia. The best summer forages, included Amber sorghum, White Kafir, and a mixture of White Kafir corn and soy beans with yields amounting to 6.25, 4.58, and 4.35 tons per acre, respectively. At Warrensburg a mixture of oats and Canada field peas proved best for spring forage and one of soy beans and sweet sorghum for summer forage. In cooperative tests with sweet clover, failures were reported wherever oats was used as a nurse crop. Sudan grass seeded in rows 3 ft. apart produced 2.6 tons of cured forage per acre at Warrensburg. Seeded after rye at Columbia, it produced 1.56 tons and in a mixture with soy beans, 4.2 tons.

Of 84 varieties and strains of soy beans tested at Columbia the leading sorts produced from 18.3 bu. of seed per acre for Morse to 20.8 bu. for Virginia, and from 3.2 tons of hay for Buster Brown to 4.5 tons for Chiquita. At Maryville, the leading varieties were Peking, Wilson, and Virginia, with yields of 19.4, 18.9, and 17.5 bu. per acre, respectively. At Warrensburg, Mongol, Morse, and Mikado were best with respective yields of 17.9, 17, and 14.3 bu. On the Russell farm better yields of both seed and hay resulted from seedings made from May 15 to June 15 than from earlier or later seedings. Practically no difference in yield resulted from seedings made in 16-in. and 42-in. rows, while drilling Jet soy beans in rows 8 in. apart gave the same yields when seeded at the rate of 90 lbs. per acre as at a rate of 120 lbs. At Maryville, seeding at the rate of 25 lbs. per acre in rows 3 ft. apart gave slightly larger yields than lower rates of seeding, while at Warrensburg a 30-lb. seeding rate produced 13.7 bu. per acre and a 20-lb. rate 12.8 bu. New Era cowpeas produced 15.1 bu. of seed per acre as compared with 12.2 bu. for Medium Yellow soy beans. Leading varieties of cowpeas and soy beans compared for hay production gave average yields of 3.4 and 3.1 tons per acre, respectively.

Shallu, White Kafir corn, and Standard milo maize with respective yields of 81.3, 63, and 43.7 bu. per acre were grown at Warrensburg in comparison with Commercial White, St. Charles White, and Leaming Yellow corn, which produced 69.3, 58.3, and 47.3 bu., respectively.

In variety tests with cotton early maturing strains showed a marked superiority over late maturing sorts. King Improved with 380 lbs. of lint per acre and Simpkin Prolific with 330 lbs. were the best early varieties, and Mebane Triumph with 260 lbs. and Rowden with 213 lbs. the best late varieties.

Bigg Seven Ear and Cock Prolific corn grown at Kennett yielded at the rate of 38 and 33 bu. per acre, respectively, as compared with 32 bu. for Reid Yellow Dent and 30 bu. for St. Charles White, the two best native sorts. Cultural tests with corn at Warrensburg resulted in a yield of 59 bu. per acre for surface planting with normal cultivation, 70 bu. for list planting with normal cultivation, and 73 bu. for surface planting with late cultivation. At Maryville, with normal cultivation, surface planted corn produced 75 bu. per acre and list planted corn 84.2 bu.

Leading varieties of wheat tested at Columbia produced from 23.8 bu. per acre for Poole to 30.6 bu. for Harvest Queen. At Warrensburg the yields of the best sorts ranged from 23.5 bu. for Fulcaster to 27.9 bu. for Turkey. Selections of Pole, Early Ripe, and Fulcaster grown at Columbia have produced 4-year average yields of 35, 27.8, and 42 bu. per acre, respectively, as compared with yields of 34.3, 33.6, and 37.1 bu. for the original stock.

Variety tests with oats at Columbia resulted in maximum yields ranging from 41.1 bu. per acre for Fulghum to 42.2 bu. for Iowa 105. At Maryville, the best varieties ranged from 65.3 bu. for Silvermine to 69 bu. for Red Rust Proof. Burt and Kherson grown at Warrensburg each produced about 20.5 bu. per acre. Tests with winter oats have thus far been unsuccessful.

Spring barley produced from 19 to 30 bu. per acre in variety tests at Columbia. It is stated that the crop is fairly safe for the northern part of the State, uncertain for the central part, and generally a failure in southern Missouri.

Crop production in the northern sand hills [of Nebraska], J. COWAN (*Nebraska Sta. Bul. 171 (1919), pp. 3–6*).—Work with corn, small grains, potatoes, beans, and hay and fodder crops at the Valentine substation is briefly reviewed. See also a previous note (E. S. R., 41, p. 434).

[Report of field crops work in North Carolina, 1918], C. B. WILLIAMS (*North Carolina Sta. Rpt. 1918, pp. 28–35*).—Variety tests and crop improvement work with cotton, corn, soy beans, cowpeas, wheat, oats, and rye conducted at various points in the State are briefly described in a continuation of similar work (E. S. R., 39, p. 337). The best varieties of field crops grown at the different experimental centers are indicated in each case. Fertilizer and cultural tests with tobacco are also noted.

Selected strains of cotton isolated during the past four years are said now to present a uniform type and to have transmitted their qualities during the past two years. While in individual strains the values for size of boll, length of staple, percentage of lint, and height of plant have fluctuated from season to season, the strains have maintained the same relation to each other. The lowest yielding strain produced on the average 81.8 gm. of seed cotton per plant and the highest yielding strain 179.6 gm. In a comparison of Mississippi- and North Carolina-grown seed of the same strain of cotton, very little difference has been noted in the earliness of the plants grown from seed from the two localities, while the Mississippi seed has produced slightly taller stalks and the North Carolina seed a larger yield.

In a comparison of Rosen with Abruzzi rye the former is said to be generally too late for Piedmont and eastern North Carolina conditions, and also to have produced less early grazing than Abruzzi. In the mountain section of the State Rosen has given some promise for seed production.

Tests made on the Granville Farm are held to indicate that the yield of tobacco can be increased by closer planting without injuring the quality of the crop. From 5,000 to 5,500 plants per acre are believed to give the best results. Priming as compared with cutting tobacco resulted in a gain of 240 lbs. per acre. In fertilizer tests conducted at Reidsville an increase in the ammonia content of the fertilizer application was followed by a greater susceptibility to leaf spot and other diseases, while potash appeared to stimulate the resistance of the plant to disease.

[Report of work with field crops in the Netherlands, 1913–1916], P. VAN HOEK (*Dept. Landb., Nijv. en Handel [Netherlands], Versl. en Meded. Dir. Landb., No. 1 (1919), pp. VII+157*).—This describes the continuation of similar work previously noted (E. S. R., 32, p. 630). The report is divided into two parts, the first dealing with soil fertility tests, variety, cultural, and fertilizer experiments with potatoes and sugar beets, and variety tests with wheat, rye, oats, and barley; while the second part comprises observations on the establishment and maintenance of pasture land and on weed control.

[Report of field crops work in the Dutch East Indies], J. VAN BREMA DE HAAN (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1918, pp. 68–73,*

*345–354*).—Cultural tests with cotton and plant-selection work with rice and other important crops during 1916 are described as heretofore (E. S. R., 38, p. 527).

**[Report of field crops work in Java, 1916–17]**, C. VAN ROSSEM (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab., No. 19 (1918), pp. 123*).—This describes the continuation of work previously noted (E. S. R., 38, p. 735).

**Harvest report [Roseworthy Agricultural College], 1917–18 and 1918–19**, W. J. COLEBATCH (*Jour. Dept. Agr. So. Aust., 21 (1918), Nos. 8, pp. 623–634; 9, pp. 686–691; 10, pp. 759–766; 22 (1919), Nos. 8, pp. 610–627; 9, pp. 709–718*).—In continuation of work along the same general lines as previously noted (E. S. R., 38, p. 133), crop data relating to wheat, barley, oats, rye, and forage crops are presented for the seasons indicated.

**Sisal and henequen as binder-twine fibers**, H. T. EDWARDS (*U. S. Dept. Agr. Yearbook 1918, pp. 357–366, pls. 4*).—The importance of the binder-twine industry in relation to the national food supply is indicated, and the possibilities of production in United States territory of sisal and henequen, said to furnish approximately 90 per cent of the raw material now used in the manufacture of binder twine, are discussed. It is stated that henequen has been grown successfully in Porto Rico and the Philippine Islands, while it is deemed practicable to develop the sisal industry in the Philippines, Hawaii, Porto Rico, and possibly Florida.

**The vitality of alfalfa seed as affected by age**, W. P. HEADDEN (*Proc. Colo. Sci. Soc., 11 (1919), pp. 239–249*).—The author describes observations on the viability of various grades of alfalfa seed held over a long period of years without any effort to preserve the seed under definite temperature and moisture conditions.

It is concluded that good, sound, clean alfalfa seed, kept under fair but not ideal conditions, will retain its vitality for 23.5 years without any perceptible abatement. Good, commercial seed, preserved under rather disadvantageous conditions, retained a fair degree of vitality, 46 per cent, for 27.5 years, while very inferior seed, third quality screenings, kept under rather indifferent conditions, contained 16.5 per cent of viable seeds when 22.5 years old.

**The vitality of alfalfa roots**, H. G. MACMILLAN (*Proc. Colo. Sci. Soc., 11 (1919), pp. 251, 252, pls. 4*).—The author records observations on volunteer alfalfa appearing in tilled fields in northern Colorado during the spring of 1918. Mention is made particularly of a plant found to have grown from an adventitious bud on an old root, three shoots having been sent out although only one survived. The root lacked a crown and both ends were shattered and decayed, no growth having occurred during the summer of 1917. Rootlets also developed. Many plants were found where the new growth had arisen from the old crown.

**A factor analysis of barley**, G. VON UBISCH (*Ztschr. Induktive Abstam. u. Vererbungslehre, 17 (1916), No. 1–2, pp. 120–152, figs. 15; abs. in Genetica [The Hague], 1 (1919), No. 3, p. 301*).—The author describes observations on the behavior of certain characters in barley crosses, including the density of the spike, the number of rows of spikelets, the length of the grain, the nature of the hood, and the toothing of the first lateral nerve of the outer flowering glume. The results may be summarized as follows:

The density of the spike is said to be determined by a factor pair designated as Ll, looseness dominating and corresponding to an internodal length of the rachis of more than 3.5 mm. Two-rowedness as compared with six-rowedness depended upon two factor pairs, ZzWw, of which Z must be present either in the homozygous or heterozygous condition in order that the plant is not six-rowed.

The length of the grain was dependent upon two factor pairs, Aa, which must be present in order that long grains may appear, and Vv, which has a shortening effect. The influence of the latter factor is said to be less marked than that of the former. The correlation between Aa and Ll is represented by the ratio of 5 AL : 1 Al : 1 aL : 5 al.

The hooded form was determined by a factor pair Kk. The hooded cultures examined are said to have contained the factor A in a latent condition, this being capable of expressing itself only in the presence of k. In the heterozygotic condition of KkAA or KkAa so called stemmed hoods appeared.

Three factors were found to be involved in the toothing of the nerve of the flowering glume. The first factor pair, Gg, which produced marked toothing, was found to be correlated with Zz according to the ratio of 1 ZG : 5 Zg : 5 zG : 1 zg. The second factor G′g′ gave rise to isolated teeth, and transmitted itself independently of the first factor according to the simple ratio of 3 scarcely toothed individuals : 1 not toothed. The third factor effected quite fine toothing, perceptible only under the microscope.

**The growing of beans in Scotland**, J. Malcolm (*Scot. Jour. Agr., 2 (1919), No. 1, pp. 4–10*).—This is a general discussion of the field practices and cultural methods employed in growing the bean crop, together with brief notes on insect pests affecting beans in Scotland and on the composition and food value of beans.

**Cocksfoot.—Its establishment and maintenance in pasture**, A. H. Cockayne (*Jour. Agr. [New Zeal.], 18 (1919), No. 5, pp. 257–271, figs. 12*).—This is a general discussion of the production and maintenance of cocksfoot pastures in New Zealand.

**Some flower anomalies of maize**, G. Lopriore (*Staz. Sper. Agr. Ital., 51 (1918), No. 1–2, pp. 5–23, pl. 1, figs. 2*).—The author describes and illustrates certain anomalies observed in the inflorescence of maize.

**The old and the new in corn culture**, H. H. Biggar (*U. S. Dept. Agr. Yearbook 1918, pp. 123–136, pls. 4*).—The author traces the early history of corn culture in America, and briefly discusses the importance of the crop both in the past and at the present time. See also a previous note (E. S. R., 40, p. 137.)

**"Northerns" cotton**, G. R. Hilson (*Agr. Jour. India, 14 (1919), No. 2, pp. 300–314*).—The production and marketing of so-called Northerns cotton in the Madras Presidency is described. Improvements in the crop, in cultural methods, and in marketing conditions are suggested. Northerns is said to comprise a mixture of varieties of *Gossypium herbaceum* and *G. indicum*.

**The improvement of "Tinnevellies" cotton**, R. Thomas (*Agr. Jour. India, 14 (1919), No. 2, pp. 315–330*).—Suggestions are presented for the improvement of the crop and of marketing conditions in the Tinnevelly tract situated in the southern part of the Madras Presidency. It is stated that the so-called Tinnevellies cotton is grown on an area of about 600,000 acres, and comprises two distinct varieties known locally as karunganni (*Gossypium obtusifolium*) and uppam (*G. herbaceum*).

**Cotton warehousing—benefits of an adequate system**, R. L. Newton and J. M. Workman (*U. S. Dept. Agr. Yearbook 1918, pp. 399–408, figs. 2*).—The authors discuss the necessity for better constructed and better managed cotton warehouses, the functions of the warehouse, the formation of cooperative organizations among farmers for the construction and operation of cotton warehouses, and the location of the warehouse.

**Crotalaria usaramœnsis as a fiber plant**, G. F. J. Bley (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Cultuurtuin, No. 12 (1918), pp. 1–13, pls. 6*).—The production and utilization of *C. usaramœnsis* for fiber in Java are described.

**Trials of Sudan durra for brewing** (*Bul. Imp. Inst.* [*So. Kensington*], *17 (1919), No. 1, pp. 22–31*).—This comprises a review of investigations conducted by L. Briant and H. Harman as to the suitability of *Sorghum vulgare* for brewing purposes. It is concluded that if sufficient grain is obtainable at favorable prices it can be successfully employed in the manufacture of roasted grain for coloring and flavoring, of flakes, or in the production of sugar of a malto-dextrin type. It is deemed unlikely that durra will ever compete with barley as a malt material.

**[Furcræa fiber]**, A. Lopez (*El Fique su Cultivo y Beneficio Industrial, Medellín, Colombia, 1918, pp. 23, fig. 1*).—This describes the production and utilization of various Furcræa fibers in Colombia.

**[Proceedings of the National Hay Association]** (*Rpt. Nat. Hay Assoc., 24 (1917), pp. 298, pls. 2; 25 (1918), pp. 293, pls. 3, figs. 4*).—These volumes report the proceedings of the twenty-fourth and twenty-fifth annual conventions of the organization.

**The retting of hemp: A preliminary note**, D. Carbone (*Staz. Sper. Agr. Ital., 50 (1917), No. 6–8, pp. 261–299, fig. 1*).—The author describes in some detail observations on the bacteriological aspects of the retting of hemp.

**Lolium subulatum, "Wimmera" rye grass**, H. A. Mullett (*Jour. Dept. Agr. Victoria, 17 (1919), No. 5, pp. 266–278, figs. 6*).—Based on observations of existing stands and on the experience of various growers, an account is given of the history, present distribution, habits of growth, stock-carrying capacity, methods of propagation, and control of so-called Wimmera rye grass in Victoria. The grass has been identified as *L. subulatum*, and if controllable is said to give considerable promise as a pasture grass in the wheat belt.

**New Zealand flax**, Ventry (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 4 (1919), pp. 169–177, pls. 3; abs. in Nature* [*London*], *103 (1919), No. 2595, p. 410*).—The possibilities of growing New Zealand flax (*Phormium tenax*) on a commercial scale in Great Britain are discussed. It is suggested that experimental plantings be made on boggy and poor moorland soils, as the development of the plant under such conditions is said to be encouraging.

**The inheritance of the weak awn in certain Avena crosses and its relation to other characters of the oat grain**, A. C. Fraser (*New York Cornell Sta. Mem. 23 (1919), pp. 635–676, figs. 8*).—This paper presents additional data (E. S. R., 39, p. 234) supporting evidence on the inheritance of the weak awn in a cross between Burt and Sixty Day oats, together with a further study of the relationships of the awning factor and the conditions affecting it. The observations were continued through the $F_3$ generation. The conclusions reached may be summarized as follows:

In a cross between the fully awned Burt and the awnless Sixty Day types there was a nearly complete dominance of the awnless condition. The evidence is held to indicate that both parents contain the factor for awning, but that it is prevented from operating in Sixty Day oats by an inhibitor which is closely linked with the factor for yellow color in that variety. The production of awnless or partly awned plants in the $F_1$ generation is said to be dependent on the extent to which this inhibitor, *I*, is dominant over its normal allelomorph *i*, this dominance, in turn, being regarded as probably dependent to a large extent on environmental factors.

In the $F_2$ generation, awnless, partly awned, and fully awned plants were produced in approximately the ratio of 1:2:1. The ratio of plants not fully awned to plants fully awned approximated 3:1. An $F_3$ generation test of $F_2$ plants showed that the fully awned individuals were pure recessives, and that they bred true for 100 per cent of awns. A test of the partly awned plants

showed that nearly all were heterozygous, giving in the $F_3$ approximately three plants not fully awned to one fully awned plant. The formula for these plants would be *Ii*. A few partly awned plants of the $F_2$ generation having a very low percentage of awns were found to really belong to the awnless class. The appearance of awns on these plants is thought to be due probably to a slight modification of the action of the inhibitory factor, perhaps by environmental influences. The awnless $F_2$ plants were found to consist of two genetic types: Those plants which bred true, or practically so, for the awnless condition, and those which gave a segregation like that given by an $F_1$ plant, the formula for the first being *II*, and for the second *Ii*.

Spikelets having two awns, one on each kernel, were found only on plants having all the spikelets awned. The irregular occurrence of such two-awned spikelets is thought to indicate that no definite genetic factor is involved, but rather that it is the natural behavior of the awning factor to produce two awns occasionally in the absence of the inhibitory factor.

Environment seemed to affect the production of awns to a considerable extent. While experimental evidence is wanting, general observation suggested that an increase in the moisture content, organic matter, and nitrogen of the soil tended to decrease the number of awns.

Strong and intermediate awns appeared in small numbers on a few of the $F_2$ plants and in about the same relative numbers on the $F_3$ progeny of these plants, as well as on the progeny of certain other $F_2$ plants which bore only weak awns. It is stated that such a phenomenon may be due to a reversion of a complex nature.

A strong linkage was observed between the fully awned condition and the medium long hairs at the base of the grain. In 2,341 individuals there were about 5 per cent of crossovers. A similar linkage existed between the fully awned condition and the Burt (similar to *Avena sterilis*) type of basal articulation. Here there were practically 4.14 per cent of crossovers among 2,341 individuals. The non-Burt type of basal articulation was dominant over the Burt type in $F_1$, while the $F_2$ gave three non-Burt plants to one Burt.

Short basal hairs or no basal hairs were dominant over those which were medium long, the $F_2$ ratio being three of the former to one of the latter.

Two colors were contrasted—a red or yellowish red in Burt, and the clear yellow of Sixty Day, the $F_1$ plants being intermediate for color. The colors of the $F_2$ plants were greatly influenced by external factors, and graded into one another in such a manner as to render a perfect classification practically impossible. Burt oats possessed a factor for red and a factor for yellow which was distinct from the Sixty Day factor, and which carried no inhibitor to awning. The genetic formula for Burt would be *RR YY y' y'*, and for Sixty Day *rr yy Y' Y'*. The $F_2$ data on color agreed rather closely with the theory as to the genetic constitutions of the two parents. The ratios in two families approximated 48 reds: 15 yellows: 1 white. The $F_3$ tests supported this theory in a general way. The appearance of a few brown grains is thought to be the result either of mutation or of reversion. Finally, the author states that while other workers have shown that Sixty Day carries a factor inhibiting the production of awns, which is closely linked with the factor for yellow color because of the yellow in Burt, which carries no such inhibitor, the inhibitory effect of the Sixty Day factor was obscured.

Some further experiments with potatoes. J. Wilson and F. J. Chittenden (*Jour. Roy. Hort. Soc., 44 (1919), pp. 83–88, fig. 1*).—This describes observations made at Wisley during 1918 on the effect of spacing and of the use of seed of different origin on the yield of potatoes, supplementing work previously noted (E. S. R., 40, p. 630). The spacing experiments included plantings made in

rows 18, 24, 30, and 36 in. apart with the plants spaced 9, 12, 15, and 18 in. apart in the row for each planting distance.

The best spacing for the variety employed (Arran Chief) was found to be from 24 to 30 in. between rows and 15 in. between plants. In comparative tests of locally-grown seed potatoes with seed from Scotland and Ireland the local seed gave quite favorable results. It is stated that while all the factors making for maximum yields of potatoes are not yet known the source of the seed is a most important one.

**Potato production**, G. STEWART (*Utah Sta. Circ. 40 (1919), pp. 3–54, figs. 20*).—This comprises a general discussion of cultural methods and field practices employed in growing the potato crop in Utah, with notes on storing and marketing the product.

**[Report of work with potatoes in the Rhine Province]**, T. REMY (*Veröffentl. Landw. Kammer Rheinprov., No. 2 (1919), pp. 96, pls. 14*).—This describes variety, cultural, and fertilizer tests with potatoes conducted during 1918.

**A study of the relation of climatic conditions to the vegetative growth and seed production of rice**, F. DE PERALTA Y LEAÑO (*Philippine Agr., 7 (1919), No. 6, pp. 159–183, figs. 4*).—In an effort to study the correlation between vegetative growth and seed production in the rice plant and climatic conditions prevailing in the Philippines, plats of Inintiw lowland rice were started every four weeks during the period of April, 1916, to April, 1917, at Los Baños, and observations made on climatic and water conditions and on the growth and seed production of the plants at regular intervals throughout the experiment. The cultural methods were the same as those usually employed in the locality. The data are presented in tabular form, fully discussed, and depicted graphically. The conclusions reached may be summarized as follows:

Rice exhibited an annual vegetative growth and flowering cycle, the period required to attain maturity ranging from 104 to 174 days in the Inintiw variety. The maximum yields of grain were secured from plantings made in April, May, and June, while the yields decreased markedly up to the October seeding, increasing again with the November seeding. No definite ratio between the grain and straw was observed, although it was noted that the grain increased in weight with an increase in straw.

The maximum growth occurred during the period of highest total evaporation and the minimum growth with the least total evaporation. The yield of grain increased with an increase in the length of the panicle. The height of the plants was less during a season of low evaporation and greater during a season of high evaporation. A correlation was observed to exist between the yield of grain and the height of the plant, tall plants being accompanied by high yields. The grain yield was highest during the season of high evaporation and lowest during the season of low evaporation. The longer the period required to attain maturity the greater was the leaf area produced. Low temperature during the first month of growth appeared to induce early maturity in rice. Rice seed kept in a closed vessel at a constant temperature of about 27.5° C. (81.5° F.) was appreciably reduced in vitality within a year.

**Rice [in Tucumán]**, F. W. M. RABEN (*Bol. Min. Agr. [Argentina], 22 (1917), No. 2, pp. 149–171*).—Observations on growing the crop in Tucumán are presented, together with notes on field tests of Valencia and Japanese rices.

**South Bali [Dutch East Indies] and its rice culture**, K. VAN DER VEER (*Teysmannia, 29 (1918), No. 7, pp. 367–388, pls. 2*).—This comprises a general description of the rice industry on the island of Bali.

**The place of rye in American agriculture**, C. E. LEIGHTY (*U. S. Dept. Agr. Yearbook 1918, pp. 169–184*).—The marked increase in rye production in the

United States, the adaptability of the crop to certain soil and climatic conditions, and the utilization of rye are discussed.

The composition of the [sugar cane] planting, 1918–19, J. van Harreveld (*Meded. Proefsta. Java-Suikerindus., Landbouwk. Ser., No. 2 (1919), pp. 715–733*).—Statistics are presented similar to those previously noted (E. S. R., 40, p. 635), showing the relative distribution of the principal sugar-cane varieties grown in Java for the season indicated.

Sweet potatoes, E. W. Cole, B. C. Tharp, and T. S. Minter (*Texas Dept. Agr. Bul. 62 (1918), pp. 47, figs. 29*).—Sweet potato growing in Texas is described and considerable general information given on diseases affecting the crop, together with notes on insect enemies and on harvesting and storing sweet potatoes.

The tobacco seedbed, P. A. David (*Philippine Agr. Rev., 12 (1919), No. 1, pp. 31–65, pls. 10*).—This paper, a contribution from the Experiment Station of the Philippine College of Agriculture, deals with observations made during 1918 on preparing, sterilizing, fertilizing, shading, and planting tobacco seedbeds, together with information relative to the cost of the various treatments. Considerable tabulated data are presented, and the results secured may be summarized as follows:

Shade is deemed important in reducing evaporation and in protecting the seedbed against washing. Germination and development of the seedlings was also best on the shaded beds. A cloth shade gave better results than nipa, cogon, or banana leaves.

Treatment with formalin, copper sulphate, and hot water, as well as roasting and firing, proved to be most satisfactory in soil sterilization and disinfection. Applications of 1 : 50 and 1 : 75 formalin at the rate of 10 liters per square meter (about 7.6 qts. per square yard) effectively controlled both damping-off and weeds. A one per cent solution of copper sulphate was also beneficial in controlling weeds. The hot water and firing treatments proved to be of little value in killing weed seeds, while roasting was much more effective.

Based on the average height attained by the seedlings on the variously treated seedbeds at the time of transplanting, dried blood gave the best results, while a combination of sodium nitrate, double superphosphate, and potassium sulphate was next in order. The use of commercial fertilizers as well as manure and compost also hastened germination.

Selection studies with Deli tobacco, J. A. Honing (*Teysmannia, 30 (1919), No. 1, pp. 1–11, pls. 2*).—This describes observations made during 1916 and 1917 on selections of Deli tobacco having to do with leaf color. See also a previous note (E. S. R., 40, p. 635).

Crop rotation and fertilizer experiments, M. F. Miller and F. L. Duley (*Missouri Sta. Bul. 163 (1919), pp. 63–65, figs. 2*).—The following tabulated data are presented showing the effect of rotation and manuring on the yield of wheat after 28 years of cropping:

*1917 wheat yield on rotation experiment field.*

| Rotation and manure treatment. | Bushels per acre. |
|---|---|
| Continuous wheat, nothing | 0.2 |
| Continuous wheat, manured annually | 10.9 |
| Wheat in wheat, clover rotation, nothing | 20.7 |
| Wheat in wheat, clover rotation, manured annually | 27.4 |
| Wheat in corn, wheat, clover rotation, nothing | 13.5 |
| Wheat in corn, wheat, clover rotation, manured annually | 31.0 |
| Wheat in cron, oats, wheat, clover rotation, nothing | 30.0 |
| Wheat in corn, oats, wheat, clover rotation, manured annually | 39.4 |

Data are also presented showing the effect of crop rotation as it influences the return from manure and fertilizer on wheat:

*Wheat yields as affected by rotation, manure, and fertilizer, 25-year average.*

| Treatment. | Bushels per acre. |
|---|---|
| Continuous wheat, nothing | 9.5 |
| Continuous wheat, manured | 17.4 |
| Continuous wheat, heavily fertilized | 17.9 |
| Wheat in rotation, nothing | 20.7 |
| Wheat in rotation, manured | 25.9 |
| Wheat in rotation, heavily fertilized | 29.1 |

**The cultivation of wheat in Argentina, III, IV,** C. D. Girola (*Bol. Min. Agr. [Argentina], 20 (1916), No. 1–2, pp. 52–59, figs. 4; 22 (1917), No. 2, pp. 113–130, figs. 5*).—In continuation of work previously noted (E. S. R., 35, p. 740), the author describes and illustrates *Triticum turgidum* var. *racemosum*, and two varieties of durum wheat designated as Candeal and Taganrock, respectively. Three strains of *T. sativum*, Barleta, French, and Italian, together with two additional strains of durum wheat, Medeah and Belotourka, are illustrated, as well as *T. polonicum*, said to be often confused with Candeal.

**Fertile wheat-rye hybrids,** H. H. Love and W. T. Craig (*Jour. Heredity, 10 (1919), No. 5, pp. 195–207, pl. 1, figs. 11*).—In this paper, a contribution from the department of plant breeding, Cornell University, the authors describe a fertile wheat-rye hybrid secured in a cross between Dawson Golden Chaff and common rye. That the seed developed on the $F_1$ plant resulted from self-fertilization and not from back-crossing with wheat or rye is believed to be demonstrated by the intermediate character of its progeny. It is deemed possible that certain varieties of wheat may produce fertile wheat-rye hybrids.

**Some effects of the war upon the seed industry of the United States,** W. A. Wheeler and G. C. Edler (*U. S. Dept. Agr. Yearbook 1918, pp. 195–214, figs. 6*).—This comprises a general discussion of the effect of the war upon imports and exports of seeds, domestic demands for seed, seed production, and stocks, prices, and movement of seeds, together with some of the local problems of wholesale and retail seedsmen, and the seed reporting service of the Bureau of Markets.

**Second annual report Colorado Seed Laboratory,** W. W. Robbins (*Colorado Sta., Seed Lab. Bul., 1 (1918), No. 3, pp. 5–23, figs. 5*).—The work of the laboratory for the year ended November 30, 1918, is described. A total of 3,631 samples of seed were examined. The most common impurities of the important crop seeds sold in the State are indicated, and a list is presented showing the weed seeds found in the samples analyzed.

**Seed Reporter** (*U. S. Dept. Agr., Seed Rptr., 3 (1919), No. 3, pp. 8, fig. 1*).—Tabulated data are presented showing the estimated acreage, yield, and prices of medium red, alsike, and sweet clover, and alfalfa seed about August 22, 1919; the commercial stocks, receipts, and exports of field seeds and root and vegetable crop seeds for Canada based on the seed survey of June 30; the commercial stocks and receipts of field seeds by geographic divisions for the United States as of June 30; the commercial vegetable seed stocks of the United States on June 30 for each of the past four years; and the imports of forage plant seeds permitted entry into the United States. Information relative to the sugar beet seed situation; vegetable seeds; the red, alsike, and sweet clover and alfalfa seed outlook; the hairy vetch seed crop; and the movement, price, and

quality of timothy, redtop, Kentucky blue grass, orchard grass, meadow fescue, and white clover seed August 22, 1919, is also briefly noted.

**The identification and control of Colorado weeds**, W. W. ROBBINS and B. BOYACK (*Colorado Sta. Bul. 251 (1919), pp. 126, figs. 77*).—The principal weeds occurring in the State are described and illustrated and control measures indicated in each case. The general aspects of weed control, the Colorado pure-seed law, the losses caused by weeds, the introduction, spread, and distribution of weeds in Colorado, some principles and methods of weed control for both dry land and irrigated farms, and the utilization of weeds for silage are discussed.

**Weed immigration into Michigan**, H. T. DARLINGTON (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 261–267*).—Of 225 weeds mentioned by Beal (E. S. R., 36, p. 739), the author states that 147 have been introduced into the State. Based on official catalogues of plants in Michigan, lists have been prepared giving the names of those weeds present in 1839, and new weeds appearing between 1839 and 1860, 1860 and 1881, 1881 and 1904, and 1904 and 1915, respectively. It is stated, further, that of the introduced weeds 56 per cent are native of Eurasia, 4 per cent of the West or Southwest, 3 per cent of the East or Southeast, and 3 per cent of South America, while 20 of the 25 worst weeds of the State are said to be indigenous to Europe.

**The weeds of wheat on the pampas [Argentina]**, J. WILLIAMSON (*Bol. Min. Agr. [Argentina], 22 (1917), No. 2, pp. 141–148, figs. 6*).—The distribution, habits, and means of eradication of the principal weeds infesting wheat on the pampas are discussed. The plants dealt with include *Chenopodium* sp., *Salsola tragus*, *Arjone bulbosa*, *Avena fatua*, and *Polygonum convolvulus*.

**Devitalization of the seed of Cuscuta**, M. BRESAOLA (*Staz. Sper. Agr. Ital., 52 (1919), No. 3–4, pp. 193–207*).—The author discusses further (E. S. R., 31, p. 835) the effect of heat and of sulphuric acid treatment upon the germination of the seed of *C. arvensis* and *C. trifolii*.

Exposure to dry heat at 75° C (167° F.) for one hour practically inhibited the germination of dodder seed. The seed of *Medicago sativa*, *Trifolium pratense*, and *T. repens* under similar conditions was not seriously injured, while that of *Lotus corniculatus* was actually benefitted by the high temperature. The sulphuric acid treatment appeared to be unsatisfactory.

## HORTICULTURE.

**Carbohydrate metabolism in green sweet corn during storage at different temperatures**, C. O. APPLEMAN and J. M. ARTHUR (*Jour. Agr. Research [U. S.], 17 (1919), No. 4, pp. 137–152, figs. 2*).—A contribution from the Maryland Experiment Station, dealing with the character and kinetics of the processes involved in the rapid depletion of sugar in green sweet corn after it is separated from the stalk, and more particularly with the relative rates of these processes at different storage temperatures, accurately controlled.

A method was devised by which the rate of sugar loss from green sweet corn could be determined for consecutive 24-hour periods of storage by comparing analyses of corn from the same ear. Stowell Evergreen corn, picked in the typical milk or best eatable stage and having a water content of approximately 80 per cent, was used in the study.

The depletion of sugar in green sweet corn after it is separated from the stalk does not proceed at a uniform rate, but becomes slower and slower until finally the loss of sugar ceases when the initial total sugar has decreased about 62 per cent and the sucrose about 70 per cent. Calculated on the basis of original moisture, the corn contained, when the depletion of sugar ceased,

approximately 1.5 per cent total sugar as invert sugar, 0.7 per cent sucrose, and 0.8 per cent free-reducing substances. Reversibility of the chief processes involved in the sugar depletion, resulting in an equilibrium between the rate of sugar loss and the rate of sugar formation, would account for the cessation of actual sugar loss.

Raising the temperature hastens the attainment of the equilibrium positions, which seems to be about the same for all temperatures. At 30° C. (86° F.), 50 per cent or most of the total sugar loss occurs during the first 24 hours of storage. At 20°, 25 per cent, and at 10°, or good refrigerator temperature, only about 15 per cent is depleted during the same period. The rate of sugar loss, until it reaches 50 per cent of the initial total sugar and 60 per cent of the sucrose, is doubled for every increase of 10° up to 30°.

Respiration in green corn is comparatively high when the corn is first picked, but falls off rapidly with storage. Respiration accounts for only a small part of the actual decrease in the percentage of sugar in the corn during the consecutive 24-hour periods of storage, even at 30°. One ton of husked green sweet corn during the first 24 hours of storage at 30° would lose approximately 3.2 lbs. of sugar on account of respiration. Respiration may become indirectly a more important factor in accelerating the depletion of sugar by raising the temperature on the inside of large piles of green corn.

Most of the decrease in the percentage of sugar in green sweet corn during storage is attributed to condensation of polysaccharids, chiefly starch.

Greenhouse tomato growing in Virginia, H. H. Zimmerley (*Virginia Truck Sta. Bul. 26 (1919), pp. 3–23, figs. 2*).—Practical directions are given for greenhouse tomato culture, including the control of insects and fungus diseases. Some data on investigations conducted at the station are also included.

In the fall of 1915 a test with the variety Bonny Best was conducted to determine the effect on yield of different planting distances. Plants were set 18, 24, and 30 in. apart in 30 in. rows. The 18 in. planting distance attained the highest yield with 23.3 oz. of fruit to the square foot of bed area; the 24-in. distance gave a yield of 23 oz. to the square foot; and the 30-in. distance, a yield of only 20.7 oz. per square foot. By increasing the spacing from 18 to 24 in. the additional yield per plant was practically sufficient to compensate for the increased bed area. The difference in the size of the fruit produced in the three plats was not sufficient to affect their market values.

Beginning in the fall of 1915 and continuing through three successive seasons an experiment was conducted to compare the effects of the single, double, and triple systems of training as to the season of maturity and total yield of fruit. As an average for the three seasons the single-stem plants yielded highest, with an average yield of 37.9 oz. of fruit per square foot bed area; those with double stems averaged 37.1 oz. per square foot, and those with triple stems only 34.3 oz. per square foot. On an average for the three seasons' test the single-stem plants outyielded the double-stem plants by 1.7 oz. and the triple-stem plants by 4.2 oz. to the square foot of bed area, during the period of the early harvest. During the period of midseason harvest the double-stem plants outyielded the single-stem plants by 0.8 oz., and the triple stem by 0.4 oz. per square foot bed surface. During the late harvest the triple-stem plants outyielded the single and double stem plants by 0.2 and 0.1 oz., respectively. These results indicate that increasing the number of stems per plant decreases early production of fruit to some extent. Individual fruits from single-stem plants averaged 0.3 oz. heavier than those of the double-stem plants, and 0.2 oz. heavier than those of the triple-stem plants. The test, as a whole, indicates that the single-stem system of training has proved slightly superior in earliness, in total yield, and in convenience and simplicity of handling.

**Army gardens in France, Belgium, and occupied German territory.** G. TRUFFAUT and H. COLT (*Versailles: Pepinieres Natl. du Touring-Club de France, 1919, pp. 64, pls. 10, figs. 3*).—This handbook on vegetable gardening was written with a view to facilitating the starting and management of the army gardens of the Allies and the United States in France. The subject matter is based upon the lines of work determined by the senior author for the French Army gardens in 1917–18.

**[Work with vegetables and fruit at the Valentine, Nebr., substation].** J. COWAN (*Nebraska Sta. Bul. 171 (1919), pp. 6, 7*).—Experiments conducted at the Valentine substation indicate that garden vegetables may be grown successfully on the light sandy soil of the northern Nebraska sand-hill region by mulching the ground between the plants with old hay, stable litter, etc., before the dry weather sets in. Under this system, small crops were grown of nearly every kind of vegetable, where without mulching all attempts to grow such vegetables were failures. Crops such as tomatoes were retarded and the ripening of the fruit delayed by mulching. In no case was the benefit derived so noticeable as in the case of potato mulching. The report indicates that mulching must be accompanied by wetting with the hose in lieu of sufficient rain.

Orchard work on dry land at the substation has been an entire failure. No attempt has been made to grow an orchard on bottom subirrigated land, but observation of attempts made on such ground by farmers has failed to discover satisfactory results, although the work in some cases was carried out under expert direction.

**[Progress report on horticultural investigations]** (*Missouri Sta. Bul. 163 (1919), pp. 53, 54, 55–62*).—Concise statements of progress made with various projects (E. S. R., 38, p. 639) during the year ended June 30, 1918, are given.

Among the investigations in charge of J. C. Whitten, the work of breeding apples for the late blooming habit was extended by making crosses between some of the leading commercial varieties and a large-fruited wild crab which blossoms later than any cultivated variety which has been found. Summing up the total observations on the yield of apple trees grown from selected and nonselected buds, no significant difference has been found between the total yield of the trees of high-yielding parents and low-yielding parents. Examination of buds in winter for forecasting probable bloom shows that the proportion of flower buds forced out in water in a sunny window corresponds very closely to the percentage of buds which bloom on the trees the following spring. Peach breeding work was interrupted through the heavy pruning of the trees following severe winter injury. The results of fall *v.* spring planting tests covering about ten years' work are to be presented in bulletin form. From the work as a whole it is again concluded that fall planting of hardy fruits is better than spring planting, and that late fall planting just before the ground freezes is superior to early fall planting. An exception to this rule is the Ingram apple, which has done better when planted in the spring.

The frost-resistant studies conducted at the station, C. C. Wiggans in charge, indicate that the need of orchard heating may be reduced by maintaining maximum sap concentration and delaying the rest period in the fall by proper spraying, pruning, and soil management. The more concentrated the sap in fruit trees or other plants, the lower their freezing point and consequently the more frost they will endure without injury. The later fruit trees go into their rest period in the fall the later will they wake up from this rest period in spring, and this prolonged dormancy opposes injury from spring frosts.

Further observations on fruit bud development as influenced by treatment and previous crops were made by C. C. Wiggans. The evidence now seems con-

clusive that, in all our leading commercial varieties of apples observed, a given fruit spur is not usually able to mature fruit and at the same time develop a fruiting bud for the following year. On Gano, Rome, and York only an occasional fruit spur produces blossoms two years in succession. Jonathan, Grimes, and Winesap produce blossoms two years in succession on the same spur somewhat more frequently. It is concluded that Gano, Rome, and York tend to produce only alternate year crops because in the fruiting year practically all their individual fruit spurs produce fruit, leaving very few nonfruiting spurs to blossom the following year. On the other hand, Jonathan and Winesap give more regular annual crops because only a portion of the fruit spurs set fruit in a given year.

Observations since the experiment began show that an individual fruit spur has a fruiting life history ranging from two to eight years. Few spurs, however, begin to bear before they are three years old and but few retain their bearing form beyond six years of age. Under favorable conditions spurs older than this develop into longer branches, upon which a new crop of fruit spurs develop. A study of the above-named varieties on different types of soil has shown that there is apparently no relation between the character of the soil in which the tree grows and the alternation of the individual spurs. Removing the blossoms from a tree by accident or design may result in a change in the fruitful year. Removing the blossoms or fruit (thinning) of an individual fruit spur or branch may to some extent bring about this change.

Sap from bearing spurs has slightly higher concentration (lower freezing point) during a considerable portion of the year than sap from nonbearing spurs. Sugar and starch are present in slightly greater amounts in the bearing spur than in the nonbearing spur. If the blossoms or fruit are removed from a bearing spur this available sugar is apparently directed toward the development of a fruit bud for the following year. Trees pruned to a low head and just now reaching fruiting age are developing fruit spurs in far larger numbers than are high-headed trees of the same age. Apparently long stems and branches not only dry out in the sun in late winter, but they bend and twist and restrict proper flow of sap. In short-stemmed trees there is no such restriction to the ready passage of sap, fruit spur development is better, and a succession of fruit spurs can be more easily renewed than by pruning.

In the orchard management investigations being conducted by J. C. Whitten and C. C. Wiggans, the number of blossoms in the spring of 1918 was much larger on the sod plats containing alfalfa, clover, or timothy than on the plats given clean tillage or tillage followed by late summer and autumn cover crops. Fruit spur development is much more marked on the sod plats, although potential fruit spurs are forming on the tillage plats. The vigor of wood growth is most marked on the tillage with cover crop plats. Thus far no final conclusions are drawn as to the best system of orchard management.

Fruit nutrition studies were continued during the year by J. C. Whitten and C. C. Wiggans. No data were available upon the effects of the various fertilizers upon the peach crop, since the fruit buds of the peach were killed throughout the State as in the preceding winter. It was again noted that the nitrogen-fed trees were in much more vigorous condition than were the trees which received no nitrogen. No visible effects were observable where potash or phosphorus, either singly or in combination, were applied to peaches in past years. Summing up the results thus far secured with both peaches and apples, it is concluded that on the various Missouri soils under test there is no apparent advantage in adding mineral fertilizers even up to the time that the orchard reaches mature bearing age. The experiments have not been con-

ducted long enough to determine whether these fertilizers may prove profitable in prolonging the life or bearing vigor of the tree after it otherwise would have begun to decline.

With one exception young peach trees and apple trees have made much stronger growth and suffered less mortality and have reached bearing age and strength sooner where nitrogen was applied. Blight, however, has during the past three years been very much more severe on the trees rendered more succulent by the addition of nitrogen. The more succulent trees suffer enough more from blight to offset the greater growth produced by the nitrogen.

Counts made in the spring of 1918 show that nitrogen is a very important limiting factor in blossom formation upon the tree. The blossoms were numerous on the nitrogen-fed trees but were entirely absent on those receiving mineral salts, although a few of the check trees had an occasional bloom. The nitrogen-fed trees are establishing a splendid stand of fruit spurs, while no such fruit spur development is beginning on check trees or those fed mineral salts. These tests indicate that available nitrogen is very essential in developing the strength, vigor, and size of young apple trees and in hastening their development to fruiting capacity, whereas no liberal amount of mineral salts is required.

Spraying investigations conducted by W. W. Lawrence during the year indicate that among the arsenicals used to destroy insects that chew and swallow their food the ortho, neutral, or triplumbic form of arsenate of lead produces the least injury to fruit and foliage, and gives satisfactory results from the control point of view. Lime and sulphur gave the most desirable results for early spraying, while Bordeaux gave better results for late spraying.

**Report of the Lamao Experiment Station** (*Philippine Agr. Rev., 12 (1919), No. 2, pp. 80–84, pls. 2*).—Brief statements of progress made in the establishment of experimental plantings of tropical fruits, citrus fruits, pineapples, avocados, papayas, mangoes, coffee, and root crops, including also data on plant and seed distribution.

**Fruit growing and training,** J. Vercier (*L'Arboriculture Fruitière en Images. Paris: Libr. Larousse, 3. ed., pp. 254, figs. 111*).—A manual of information on the culture of various fruits with special reference to training the trees and bushes into special forms. Each fruit is considered with reference to its origin, soil and climatic requirements, planting distance, fruiting period, uses, propagation, methods of pruning, diseases and insect pests, varieties recommended, and manuring.

**The culture of tree fruits,** Gressent (*L'Arboriculture Fruitière. Paris: Libr. Agr. de la Maison Rustique, 1916, 13. ed., pp. 1080, figs. 485*).—A treatise on intensive and extensive culture of orchard and bush fruits and crops, including forcing and nursery practices, together with suggestions for the care of trees in parks, avenues, and forests.

**Orchard management,** E. P. Sandsten (*Colorado Sta. Bul. 250 (1919), pp. 3–20, figs. 10*).—This bulletin discusses the general principles of orchard management, and points out some of the local problems that exist in different localities in Colorado, with suggestions for their solution.

**The commercial apple industry in the United States,** J. C. Folger (*U. S. Dept. Agr. Yearbook 1918, pp. 367–378, pl. 1, fig. 1*).—This article discusses the commercial phases of the apple industry, and briefly describes the relative importance of different regions and the factors which influence their development.

**Report of division of horticulture,** J. P. Pillsbury (*North Carolina Sta. Rpt. 1918, pp. 56, 57*).—In the grape-breeding work, hybrids of *Vitis rotundifolia* and several other species were secured by using pollen of *rotundifolia*. In

all cases except one the pollen of other species proved to be impotent when applied to flowers of *V. rotundifolia*. When the pollen of *V. vinifera* is employed, hybrids are secured with difficulty. Hybrids are readily secured when *rotundifolia* pollen is used on *vinifera*, thus indicating the prepotency of *rotundifolia*. Many of the seeds secured by using *vinifera* pollen were not viable. In view of the fact that thus far it has been impossible to secure hybrids between the wild *labrusca* and *rotundifolia* grapes, the comparative ease with which hybrids were secured with the variety Concord when *rotundifolia* pollen was used would indicate that Concord is a *labrusca-vinifera* hybrid rather than a pure *labrusca*.

In previous grape-breeding work a pink color appeared in the fruits of some of the hybrids, but the source of the color was undetermined. During the year pink-fruited hybrids were secured by using light-colored parents. One of these hybrids is self-fertile. Studies of size inheritance have shown in general that the range in size of fruit in $F_1$ hybrids extended from slightly below the minimum of the one parent to somewhat above the maximum of the other.

**Dried wine grapes** (*Cal. State Bd. Vit. Commrs. Bul. 15 (1919), pp. 28, figs. 16*).—This bulletin contains the following three articles: The Market for Dried Wine Grapes, by E. M. Sheehan (pp. 3–5); Methods and Returns, by F. T. Bioletti (pp. 6–9), in which the author discusses various means of utilizing wine grapes in lieu of their use for wine making; and An Evaporator for Wine Grapes, by W. V. Cruess (pp. 10–28). This last article describes and illustrates an evaporator, which can be easily and quickly constructed; in addition to its use for drying wine grapes it is also suitable for drying rain-damaged grapes or prunes and other fruits.

**Certain relationships between the flowers and fruits of the lemon**, H. S. Reed (*Jour. Agr. Research [U. S.], 17 (1919), No. 4, pp. 153–165, fig. 1*).—A contribution from the California Experiment Station, in which a small group of Lisbon lemon trees in a commercial orchard was studied for two years to obtain data on their fruiting habits.

The fruit buds were distributed throughout the season approximately as follows: Sixty-six per cent during March and April, 13 per cent in November, 17 per cent between April and November, and about 3 per cent during the winter months. Few-flowered inflorescences predominated over many-flowered inflorescences. A bud on a small inflorescence had a greater chance to develop into a mature fruit than one on a large inflorescence, where competition seems to be too severe to allow all to survive.

It required from 7 to 14 months, according to conditions, for the fruit to reach maturity. Fruit set in May, June, and July matured soonest. The season at which fruit set was an important but not wholly determining factor in controlling the time required for maturity.

## FORESTRY.

**The book of the National Parks**, R. S. Yard (*New York: Charles Scribner's Sons, 1919, pp. XVI+420, pls. 56, figs. 4*),—This work contains descriptive accounts of the American National Parks, presented with the view of enabling the reader to appreciate their importance, scope, meaning, beauty, manifold uses, and value to the individual and Nation. The parks are grouped under the following general headings: The Granite National Parks, the Volcanic National Parks, the Sedimentary National Parks, and the Grand Canyon and our National Monuments. In describing the several kinds of scenery the author also presents in a popular way the practical findings of science relative to their origin.

**Farm woodlands and the war**, H. S. Graves (*U. S. Dept. Agr. Yearbook 1918, pp. 317–326*).—The author briefly sketches the part played by farm wood-

lands in supplying various war needs, and advocates the systematic improvement of farm woodlands to meet the peace requirements of the Nation.

[Progress report on forestry investigations] (*Missouri Sta. Bul. 163 (1919), p. 51*).—The fence post preservative test being conducted by E. C. Pegg continues to show the superiority of the open-tank method of treatment over all other methods (E. S. R., 38, p. 644).

The basket willow tests were also continued. Thus far no regularity of yield has been shown in relation to different methods of spacing. The problem of sprouting has been worked out through the use of vats or tanks.

**Progress report of forest administration in the Province of Assam for the year 1917–18**, A. W. Blunt and W. F. L. Tottenham (*Rpt. Forest Admin. Assam, 1917–18, pp. [82], pl. 1*).—The usual report on the management and exploitation of the forests of Assam for the year ended June 30, 1918. Important data relative to alterations in forest areas, forest surveys, working plans, forest protection, miscellaneous work, yields in major and minor forest products, revenues and expenditures, etc., are appended in tabular form.

**Progress report on forest administration in Coorg for the year 1917–18.** H. Tireman (*Rpt. Forest Admin. Coorg, 1917–18, pp. 2+14*).—A report similar to the above on the administration of the State forests in Coorg for the year ended June 30, 1918.

**[Report on tree culture in the northern Nebraska sand hills]**, J. Cowan (*Nebraska Sta. Bul. 171 (1919), pp. 7, 8*).—Growing trees in quantity, such as is needed for groves and windbreaks on the dry sandy land of the region has been one of the hardest and most expensive operations undertaken at the Valentine substation. Bull pines raised from seed collected in the vicinity have done better than any other variety of tree, but it is questionable whether they will be long-lived. The probable cause of the trouble with both deciduous trees and conifers is the shallow rooting habit induced both by shallow soil and moisture near the surface during the growing season. Also in the case of deciduous trees, borers attack every species grown at the substation.

**Afforestation: Its practice and science**, M. C. Duchesne (*Rpt. Brit. Assoc. Adv. Sci., 1918, pp. 68–79*).—A paper, with discussion following, in which the author emphasizes the importance to Great Britain of an assured national timber supply, and brings out the need for closer association of science with practice in building up future timber reserves.

**Reafforestation with conifer trees**, L. Breton-Bonnard (*Le Reboisement les Résineux. Paris: J. B. Baillière & Sons, 1918, pp. 276, figs. 61*).—A treatise on reafforestation based primarily on the author's experiences. Introductory considerations point out the importance of reafforestation projects to France. Part 1 contains descriptive accounts of coniferous species and varieties recommended for planting, part 2 contains cultural details, part 3 treats of insects and diseases of conifer trees, and part 4 contains examples of returns from conifer plantations.

**Effect of removing the pulp from camphor seed on germination and the subsequent growth of the seedlings**, G. A. Russell (*Jour. Agr. Research [U. S.], 17 (1919), No. 5, pp. 223–238, pls. 2, figs. 5*).—A contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, describing germination tests conducted with camphor seeds to determine the cause or causes of the low germination obtained both experimentally and commercially. The results of the investigation are presented in a series of tables and graphs and fully discussed.

Removing the pulp from the seed was found to hasten germination by an average of two weeks; it also gave an increase in germination of approximately

525 per cent over that of unpulped seed. A larger and more sturdy seedling tree was obtained for transplanting than when the pulp was not removed. It is believed that in commercial plantings the removal of the pulp from the seeds will increase the percentage of germination by at least 200 per cent, thus producing 40,000 more seedling trees to each acre of seed bed. The increased germination and the well-developed trees that result will repay many times the cost of the labor involved.

**On the origin of chicle with descriptions of two new species of Achras**, H. Pittier (*Jour. Wash. Acad. Sci., 9 (1919), No. 15, pp. 431–438*).—Investigations conducted by the author indicate that chicle, which is commonly supposed to be the product of the sapodilla or naseberry tree (*Achras zapota*), is in reality the product of several species belonging possibly to more than one genus of the Sapotaceæ. Two new species of Achras, *A. chicle* and *A. calcicola*, are here described.

**The European elder (Sambucus nigra)**, M. Degli Atti (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 14 (1916–17), pp. 13*).—An account of the European elder and its economic uses, including a list of consulted literature.

**The strawberry tree and its utilization**, F. La Marca (*Il Corbezzolo e la Sua Utilizzazione. Casale Monferrato: Marescalchi Bros., 1914, pp. VIII+105, figs. 4*).—An account of the strawberry tree (*Arbutus unedo*), its importance to Italian agriculture, and its industrial utilization.

**Variation in Hevea brasiliensis**, S. Whitby (*Ann. Bot. [London], 33 (1919), No. 131, pp. 313–321, fig. 1*).—Results are given of observations in the Federated Malay States, which were made to determine the extent to which variation occurs in the amount of rubber yielded by individual trees of *H. brasiliensis* of the same age and growing under the same conditions, and also as to the possible correlation between the yield of rubber and the girth of the trunk. In addition to data on the above phases, the observations made afford information relative to the extent of variation in the rubber content of the latex of individual trees and other peculiarities observed in connection with the study.

The data as a whole indicate that there is a comparative constancy of the yield from individual trees. A tree which was seen to be a high yielder at one time could be relied upon to give a high yield at all times. The marked variation in rubber yield between different trees examined suggests the great possibilities of seed selection in improving rubber yields. The data secured also indicate that the extent of variation on a normal tapping area may be such that it is quite impermissible to assume that small groups of trees in the tapping area will have the same yielding capacity as similar small groups in the same area. The girth data secured indicate that although there is a definite positive correlation between yields and girth the extent of the correlation is not sufficient to justify very much emphasis being placed on girth when selecting trees for thinning out.

Certain peculiarities were observed in the case of particular trees which were also constant over considerable periods of observations, and which may probably be regarded as characteristic of the trees displaying them. In some cases rapid discoloration of the latex appeared to be characteristic of the tree. The latex of other trees showed a tendency to rapid coagulation. A marked cream-straw color seemed to be characteristic of the latex from a small percentage of trees.

**Selection and thinning**, A. A. L. Rutgers (*Meded. Alg. Proefsta. Alb. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser., No. 17 (1919), pp. 19, pls. 2*).—A lecture on this subject in which the author presents experimental data to show the importance of selection and thinning as factors in reducing the cost price of raw rubber.

## DISEASES OF PLANTS.

**Pan American cooperation in plant quarantine**, R. SUNDBERG (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 869–874*).—An outline with discussion is given of conventions and other steps taken in preparations regarding quarantine as looking to the protection of plants against parasites.

**Pan American cooperation in plant quarantine**, C. L. MARLATT (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 888–904*).—This completes the series of which the foregoing has been noted, and includes the discussion which followed.

**Phytopathological inspection of horticultural and viticultural establishments** (*Bul. Mens. Off. Renseig. Agr. [Paris], 16 (1917), Apr.–June, p. 262*).—The number of establishments engaged in viticulture or horticulture submitting to phytopathological inspection is said to be increasing steadily, the numbers thereof being 83 for 1914, 103 for 1915, and 132 for 1916. The values of exports also show a steady and substantial increase, which is attributed to the greater assurance of safety conferred by observance of the regulations and precautions regarding inspection.

**Seed and soil treatment for vegetable diseases**, M. T. COOK (*New Jersey Stas. Circ. 106, pp. 4, fig. 1*).—Specific directions are given for the control of a number of seed-borne diseases, and suggestions are made for soil sterilization by the use of formaldehyde and steam.

**[Work done in plant pathology]**, G. H. COONS (*Michigan Sta. Rpt. 1918, pp. 273–276*).—An outline is given of work in progress in plant pathology at the station, the principal investigation being of diseases of potato, celery, cereals, beans, and muck crops.

In connection with the potato disease work it has been found that the times of treatment with formaldehyde and corrosive sublimate can be shortened from the 1½ to 2 hour period commonly recommended to 15 minutes for formaldehyde and 30 minutes for corrosive sublimate, and still obtain efficient disease control. In the study of the control of cereal diseases by the use of formaldehyde, as a result of field laboratory and greenhouse tests, the author claims that concentrated formaldehyde when applied according to directions does not injure germination, and that where injury occurs it is brought about either from failure to follow directions as to dosage or time of covering, or from allowing the grain to stand too long before planting. Experiments have proved that complete removal of formaldehyde from grain is not possible by airing under ordinary conditions. A recommendation is made for immediate planting after treating seed.

**[Report of the department of] botany**, G. M. REED ET AL. (*Missouri Sta. Bul. 163 (1919), pp. 31–33*).—A progress report is given of investigations on the physiological relation of powdery mildews to their host plants, forest tree diseases, systematic and physiological studies of rusts, grain smuts and their control, and a watermelon disease said to occur in southeast Missouri, the lines of work and results described following quite closely those previously given (E. S. R., 38, p. 645).

Practically all varieties of oats and barley have been found susceptible to their respective mildews. Very few varieties of oats have been found that are not susceptible to crown rust when grown under greenhouse conditions. Inoculation experiments with sorghum smut have again shown that the milos are free from smut and feterita only slightly infected. Other varieties of sorghums vary in the proportion of infection. Oat varieties were found to differ widely in respect to infection by *Ustilago avenæ* and *U. levis*. Seed treatments with

copper sulphate and formaldehyde were found to be quite efficient in the control of oat smut. A study of the watermelon disease indicates that there are several strains of Fusarium that cause wilt, and that the disease is favored by certain types of soil.

**Damage from soil fungi**, F. J. SEAVER (*Jour. N. Y. Bot. Gard., 18 (1917), No. 212, pp. 186–188*).—The considerable damage noted among various plants in the New York Botanical Garden during the season of 1917 is attributed to the fungi which normally inhabit the humus of the soil. Funkias, the foliage of which had been partly killed, showed no leaf fungus in sufficient abundance to account for the injury, but a Sclerotium in the soil appeared to have attacked these plants as well as others, causing considerable damage. Tulips failed to bloom and appeared to be suffering from the presence on the bulb of *S. tulipæ*, which possibly also originated in the soil. Rootstocks of the wild geranium were injured by another fungus which has been brought under investigation.

**[Botany and phytopathology, Canada]**, T. A. CREELMAN (*Rpt. Min. Agr. Canada, 1918, pp. 48–50*).—Forestry investigations have demonstrated the presence, over such wide areas, of white pine blister rust on its secondary host, currant or gooseberry, that it is feared that the control of the disease within the area of general infection will not be possible. Work has been carried on relative to the hibernation of the fungus on currants, longevity of the spores, distance of their transportation by winds, and other phases of the disease looking to its control.

Increased attention has been paid to the control of plant diseases generally. Losses from grain rusts were not severe during the year. Apparently a means has been worked out for controlling peach canker, which now causes much loss. Studies are reported in connection with potato diseases, leaf roll, club root, apple scab, and grain diseases.

**Plant diseases [in Ireland]** (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 18 (1917–18), p. 60*).—A new disease of potato has been studied and has received the name "foot rot." It is said to be due to a new species of Phytophthora in the soil allied to that producing pink rot, also that producing potato blight.

The Colletotrichum causing a disease of flax seedlings has been shown to hibernate in the skin of the seed, infecting the plant while very young. A seed treatment has been worked out which has not yet received practical application in seed tests.

**A list of diseases of economic plants occurring in the Bombay Presidency**, H. M. CHIBBER (*Dept. Agr. Bombay Bul. 65 (1914), pp. 27*).—This list of diseases is arranged according to host plants. An index is given, together with a classified list of the 71 genera of fungus parasites in connection with the host plants. The author records also, 1 bacterium, 1 alga, 5 flowering plants, 2 nematodes, 1 woolly mite (*Phytoptus* sp.), and some diseases due to unknown causes.

**Foot and stalk disease of wheat**, E. FOEX (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 18, pp. 543–548*).—A distinction is drawn between the lateral wheat stalk disease caused by *Leptosphæria herpotrichoides* and the more basal, frequently subterranean, and usually encircling attack due to *Ophiobolus graminis*. The results of observations during several years are outlined as regards the relations to disease of such factors as fertilizers, seeding time, and crop succession.

**The black stem rust and the barberry**, E. C. STAKMAN (*U. S. Dept. Agr. Yearbook 1918, pp. 75–100, pls. 10, fig. 1*).—A popular account is given of the

black stem rust (*Puccinia graminis*) on various cereals, the losses entailed by the disease, and the relation of the common barberry and other host plants to the spread of the disease.

Immunity and inheritance in plants, D. McAlpine (*Advisory Council Sci. and Indus., Aust., Bul. 7 (1918), pp. 78–86*).—Before the conference of Agricultural Scientists convened at Melbourne November 9–16, 1917, the author delivered an address regarding the immunity of plants to disease, its probable cause, and its relation to heredity, with practical suggestions regarding the black or stem rust, which is declared to be the most injurious rust of wheat in Australia.

A little known disease of alfalfa, Fron and Lasnier (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 22, pp. 629–631, 642–644*).—An account, partly descriptive, is given of a disease of alfalfa attributed to *Urophlyctis alfalfæ*, which is thought to affect this plant in widely separated regions.

The æcial stage of alsike clover rust, W. H. Davis (*Proc. Iowa Acad. Sci., 24 (1917), pp. 461–472, pls. 2, figs. 6*).—A discussion and tabulated statistics regarding characters and behavior are given in an attempt to establish the proper systematic disposition to be made of the rust on alsike clover. It is stated that there are as many morphological differences between the æcial and pycnial stages of the rust on *Trifolium hybridum* and *T. repens* as between those on *T. repens* and *T. pratense*, which are regarded as two separate rusts.

Diseases of the potato, F. D. Heald (*Proc. Wash. State Hort. Assoc., 14 (1918), pp. 115–124*).—This is a somewhat systematic discussion from the standpoint of national food conservation of the causation, effects, and control of diseases affecting the potato output in Washington.

Potato leaf roll, E. Blanchard and C. Perret (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 10, pp. 356–358*).—This is a continuation of the study of potato leaf roll, previously noted (E. S. R., 40, p. 347; also E. S. R., 41, p. 51). Nitrates appear to exert a certain beneficial effect on potato plants in this connection.

Potato spraying trials in the Cambridgeshire Fens, 1918, F. R. Petherbridge (*Jour. Bd. Agr. [London], 25 (1919), No. 10, pp. 1166–1172*).—A detailed account is given of the first trial with horse-drawn sprayers in the Cambridgeshire Fens. Causes of imperfect or undesirable results are pointed out. It is considered that the value of spraying in this locality can not be decided from the results of a single season.

Bacterial blight of soy bean, W. H. Tisdale (*North Carolina Sta. Rpt. 1918, p. 59*).—This note is largely based on work of the previous head of the department, F. A. Wolf.

The disease is said to be due to a bacterium that has been isolated and named *B. sojæ* n. sp., and has been reported from Nebraska, Connecticut, Wisconsin, and North Carolina. It is characterized by water-soaked angular spots on the leaves and cotyledons. Infected seed are believed to be the chief means by which the disease is carried over winter and introduced into new localities.

A disease of tomato and other plants caused by a new species of Phytophthora, G. H. Pethybridge and H. A. Lafferty (*Sci. Proc. Roy. Dublin Soc., n. ser., 15 (1919), No. 35, pp. 487–505, pls. 3; also in Gard. Chron., 3. ser., 65 (1919), No. 1686, pp. 188, 189, fig. 1*).—What appears to be a new disease of tomato is here dealt with in systematic detail. The roots and lower stem developed a rot (causing finally death of the plant) for which the name rot is suggested. The fungus is described under the name *P. cryptogea*. The same type of disease associated with the same fungus occurs in Petunia; also probably in Aster and Cheiranthus. Artificial inoculation showed the fungus to be pathogenic to *Solanum tuberosum*, *Gilia tricolor*, and *Fagus sylvatica*, but not

to *Senecio vulgaris* or *Nicotiana affinis*. The disease originates in the soil, in which it is thought oospores of the fungus hibernate.

Methods of control as outlined include sterilization by steam, also amputating diseased portions and treating the remaining portion as a cutting.

**Dry-rot of turnips.**—Suggestions regarding control, A. H. Cockayne (*Jour. Agr. [New Zeal.], 17 (1918), No. 2, pp. 71–73*).—Results of investigational work in the field and laboratory are presented showing that infection by *Phoma napobrassicæ* appeared sooner on early than on late sowings of various crucifers and increased until September, although not much loss occurred in July. All varieties of swedes so far as studied are about equally susceptible. Infected soils show earlier than clean land the appearance of dry-rot, which may be delayed by the application of lime. Swedes under cover keep better than those in the field, though earthing up reduced infection. An outline of suggested work is given with reference to reduction of loss from dry-rot.

**Orchard experimental work by Stoke Fruitgrowers' Association** (*Jour. Agr. [New Zeal.], 17 (1918), No. 4, pp. 225–230*).—In this report, read by W. C. Hyde, experiments are described in which lime-sulphur proved superior to atomic sulphur as a general fungicide in orchards. The invigorating effect of spring applications of Bordeaux mixture to apple trees was confirmed, as was also its favorable action against black spot when properly followed by lime-sulphur as compared with an application of lime-sulphur alone. Weak copper sulphate as a summer spray for apple trees proved impracticable. An application of oil following a fungicide proved uneconomical. Naphthalene lime-sulphur gave promising results as a commercial fungicide and a contact insecticide. Proper timing of orchard cultivation is considered important in connection with fungus infection of orchard trees. It was found that lime-sulphur 1 : 125 and atomic sulphur 15 lbs. to 100 gal. of water applied in summer produced no scorching. Bordeaux mixture is a more effective spray for peaches than is lime-sulphur.

**Treatment of apple canker diseases, J. C. Whitten** (*Missouri Sta. Bul. 163 (1919), p. 54*).—The author recommends for the control of apple canker the pruning out of limbs that are dead or practically destroyed. The limbs should be cut close and the wounds painted with common paint containing corrosive sublimate. Where canker occurs in patches on the limbs or side of the tree the wound should be scraped clean and painted with disinfected paint. It is claimed that 80 per cent of canker infection may be avoided by reducing the number of unnecessary wounds during pruning and cultivation.

**Apple powdery mildew a serious menace to orchards, D. F. Fisher** (*Better Fruit, 13 (1919), No. 10, pp. 3–6, figs. 6*).—It is stated that apple powdery mildew (*Podosphæra leucotricha*) is now commonly found in all of the major apple growing districts of the Pacific Northwest, causing loss in which the injury to the tree extends over more than one season. Though the disease is as yet localized, it is feared that favoring conditions may make it general over this region. A discussion is given of its relations to such factors as wind, precipitation, dew, and temperature. The fungus is also occasionally found on pears in this section.

At Wenatchee, Wash., it was found that, while pruning could be made a valuable supplement to spraying, the latter used alone was in the end more economical. Of the means employed, ammoniacal copper carbonate appears to be the best single spray for all seasons, though it is thought that neutral Bordeaux mixture may prove as effective and perhaps cheaper. Copper sprays are regarded as a costly and makeshift supplement to sulphur sprays during the period of burning sunlight when sulphur sprays are unsafe, although

these form the chief reliance during the spring when the best progress can be made. Details are given of treatments employing these sprays in this area. The necessity is emphasized of covering every part of leaves and twigs, with special attention to the terminals. For this purpose, pressures of 200 to 250 lbs. are recommended to be employed in connection with eddychamber or whirlpool nozzles of the driving mist type.

**Apple scab and its control**, J. W. EASTHAM (*Canad. Hort., 41 (1918), No. 11, pp. 253, 254, fig. 1*).—Outlining recent conditions and experiences regarding apple scab in portions of British Columbia, the author outlines recommendations based on the results now available of work done during the two previous years. The chief defense relied upon as regards apple scab is timely and thorough spraying with lime-sulphur, which is said to have almost entirely superseded Bordeaux mixture for this purpose. Suitable concentrations employed are 1:30 for the dormant, 1:35 or 1:40 for the pink, and 1:40 for any of the latter sprays. The effects on the apple crop of lime-sulphur are not yet fully determined.

**A new and effective disinfectant for pear blight**, F. C. REIMER (*Better Fruit, 13 (1919), No. 10, pp. 24–27*).—This contains information which has been noted from another source (E. S. R., 41, p. 452).

It is stated that tests on several pear varieties carried out with formaldehyde tend to show that the 10 per cent solution (one part of commercial formaldehyde to nine parts of water) can be safely recommended for both wounds and tools in connection with blight work during the fall and winter months. Cyanid of mercury was perfectly effective. A test is described as carried out with a solution of the pure cyanid in distilled water prepared fresh every day, carried in glass receptacles, and applied with a clean paint brush, two drops of the blight culture ooze having been applied to each wound in order to constitute a severe test.

Experiments are in progress with commercial mercury cyanid tablets commonly found on the market to determine their value in this connection.

**June drop and its relation to the weather**, C. A. JENSEN (*Cal. Citrogr., 3 (1918), No. 11, pp. 255, 277, figs. 5*).—This is a discussion of observations on June drop of the navel orange in its alleged relation to weather (charts covering June of 1917 and 1918 being given), and to other possible factors, no one or combination of which appears sufficient to explain fully its occurrence.

**Psorosis (scaly bark) of orange trees in California**, H. S. FAWCETT (*Cal. Citrogr., 4 (1919), No. 5, pp. 107, 133, 139, figs. 5*).—The statements here noted are understood to be tentative, as this disease is still under investigation at the California citrus substation. The disease is discussed as to its several stages, favoring conditions, and appropriate treatments.

**On the life history of the rose blotch fungus**, N. L. ALCOCK (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 6 (1918), pp. 193–197, pl. 1, figs. 2; Gard. Chron., 3. ser., 65 (1919), No. 1671, p. 2*).—A descriptive discussion is given of the rose disease *Actinonema rosæ* as regards the effects on the wood, with an account of the survival of the winter stage, varieties attacked, and control measures. The most effective of these consisted of 90 parts sulphur and 10 parts lead arsenate. Another almost as effective was a 5:5:50 Bordeaux mixture.

**Fomes lucidus as a parasite of trees**, W. NOWELL (*Agr. News [Barbados], 17 (1918), No. 412, p. 46*).—Plants named as subject to attack by *F. (Polyporus) lucidus*, usually at the center, include lime trees, *Pithecolobium saman*, *P. unguis cati*, *Cæsalpinia coriaria*, and species of Acacia.

**Control of oak mildew**, N. VAN POETEREN (*Tijdschr. Plantenziekten, 24 (1918), No. 3, pp. 83–101*).—Having continued observations on oak mildew, which is reviewed as far back as the beginning, in 1908, of the epidemic form, with discussion also of facts noted in 1912 (E. S. R., 28, p. 651), the author states that the injury done, though varying considerably in a given locality, is sufficient to require effective control measures. For this purpose, lime-sulphur is recommended as a suitable spray, one application each season being considered sufficient if applied when the mildew begins vigorous development.

**Pine rust in Sweden, 1917**, N. SYLVÉN (*Meddel. Stat. Skogsförsöksanst., No. 15 (1918), pp. 192–204, XIX–XXII, fig. 1; also in Skogsvårdsför. Tidskr., 16 (1918), No. 4, pp. 308–315*).—Pine rust (*Melampsora pinitorqua*) is said to have caused very little damage in Sweden during 1917. The contrast in this respect with the effects during the previous year is thought to have been due mainly to differences in weather. A principal condition for copious infection of pines and resulting injury is thought to be wet weather during May, or a relatively even distribution of precipitation during this period of spore germination and development, dry weather during May and early June being unfavorable to the development of the fungus.

**Pine rust (Melampsora pinitorqua)**, N. SYLVÉN (*Meddel. Stat. Skogsförsöksanst., No. 13–14 (1916–17), pt. 2, pp. 1077–1140, CXXVII–CXXXVI, figs. 28; also in Skogsvårdsför. Tidskr., 16 (1918), No. 4, pp. 265–307, figs. 28*).—This is an account of pine rust in portions of southern Sweden due to *M. pinitorqua*, regarding its development and spread as related to weather and to the alternate host (*Populus tremula*), from which it may spread each year to reinfect the pines.

[**Pine rust in Sweden**], N. SYLVÉN (*Naturw. Ztschr. Forst u. Landw., 16 (1918), No. 3–8, pp. 118–127*).—This is an account of the work noted above.

**Summary of the white pine blister rust situation**, H. METCALF (*Jour. Forestry, 16 (1918), No. 1, pp. 85–89*).—Referring to reports bearing on the territorial relations of white pine blister rust previously noted (E. S. R., 39, p. 758), the author states that the territorial division of the problem then indicated still holds, though west of the Mississippi River only four centers of infection have been found, none of them so located as to be dangerous. Cronartium on Ribes in Colorado, so strongly resembling *C. ribicola* as to have been assigned to that species, has been found during the past season to have a Peridermium stage on *Pinus edulis* and *P. monophylla*.

**Further notes on black-stripe canker**, W. N. C. BELGRAVE (*Agr. Bul. Fed. Malay States, 6 (1917), No. 3, pp. 154, 155*).—Discussing further (E. S. R., 39, p. 459) black-stripe canker, the author states that as a general rule black-stripe tissues need not be cut out and that sterilization of tapping knives is unnecessary if preventive painting is employed.

**Field notes and observations on brown bast**, W. N. C. BELGRAVE and F. W. SOUTH (*Agr. Bul. Fed. Malay States, 6 (1918), No. 4, pp. 181–186*).—It is stated that, so far as known, rubber trees having once developed the condition known as brown bast never recover under natural conditions, though they continue to live. Practically all methods intended to be curative or preventive are still in a purely experimental stage. Some of these are discussed with recommendations.

**Experiments on the prevention of brown bast**, W. N. C. BELGRAVE (*Agr. Bul. Fed. Malay States, 6 (1918), No. 4, p. 187*).—The suggestions here given, being purely experimental, are recommended to be tried out on small areas. Prominence is given to an application of lime raked into the soil over a radius of 5 or 6 ft., washing the trees with lime from the collar to a height of 12 in., and painting with Izal or formalin bisulphite.

**A study of the root-nematode (Heterodera radicicola) and its control,** W. P. Duruz (*Soil Sci., 4 (1917), No. 6, pp. 481–492, figs. 10*).—Means of control include excess moisture, high temperature, formaldehyde, sphagnum moss extract, and sodium cyanid dissolved in water. All decreased nematode activity and are suggested as means of control.

Sodium cyanid treatment is regarded as practical and satisfactory for nematode infestation. This substance dissolved in water is applied to the soils at the rate of 200 lbs. per acre (one-third gallon per sq. ft. of soil). A second treatment should follow about a week later. After this, the soil should be aerated and leached before planting.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Federal protection of migratory birds,** G. A. Lawyer (*U. S. Dept. Agr. Yearbook 1918, pp. 303–316, pls. 3, figs. 2*).—A popular account of the protection of migratory birds by the Federal Government.

**Life histories of North American diving birds.—Order Pygopodes,** A. C. Bent (*U. S. Nat. Mus. Bul. 107 (1919), pp. XIII+245, pls. 55*).—This bulletin reports investigations commenced in 1910 and carried on in cooperation with other American ornithologists in continuation of the work begun by Bendire. Twelve plates in colors illustrate the eggs of 37 species. A bibliography of 7 pages and a subject index are included.

**Report of the entomologist,** R. H. Pettit (*Michigan Sta. Rpt. 1918, pp. 278–280*).—Among the more important insect enemies of the year here noted are a borer in corn which appeared the previous year and has now been identified as *Noctua fractilinea;* the flower thrips, which was identified as the insect producing blemishes on Elbertas in the western part of the State (E. S. R., 40, p. 650); and *Macrosiphum cynosbati,* which produced witches' broom in Houghton gooseberry. The fungus *Isaria farinosa,* introduced by the author in several localities where the tamarack sawfly abounded, is said to be responsible for killing numbers of this pest.

**Entomology** (*Missouri Sta. Bul. 163 (1919), pp. 41–43*).—A brief report of the work of the year. The Hessian fly practically disappeared from the State, having succumbed to weather conditions and not to parasites or other natural agencies.

**Report of the division of entomology,** F. Sherman (*North Carolina Sta. Rpt. 1918, pp. 42–49*).—This report of the chief on the more important work of the year with insect pests includes a report of the entomologist, Z. P. Metcalf (pp. 45–49). The latter report deals briefly with the work with the gloomy scale, which is the most destructive insect enemy of shade maples in the State; the bean and pea weevils; the melon beetles; the tobacco flea-beetle; and insects affecting ornamental plants.

**Notes on some insect pests of Costa Rica,** J. Zetek (*Jour. Econ. Ent., 12 (1919), No. 3, p. 269*).—The notes here presented relate to observations made in Costa Rica during the latter part of February and March, 1919.

The author found the spiny citrus white fly (*Aleurocanthus woglumi*) to be very abundant on citrus of various species at Limon and at all the stations of the Northern Railroad as far as Peralta, and the purple scale to be extremely abundant on both leaves and fruit of citrus. The Hawaiian sugar cane borer (*Rhabdocnemis obscurus*) was exceedingly abundant in banana stumps and cuttings. Mention is also made of the high infestation of balsa logs about to be shipped to the United States with lepidopterous larvæ and pupæ.

**[Contributions on economic insects]** (*Ztschr. Angew. Ent., 4 (1918), No. 3, pp. V+335–391*).—Among the papers here presented are the following: Intro-

duction to a Graphic Formula of the Biology of Insects, by L. Rhumbler (pp. 335–346); The Control of Flies, by E. Teichmann (pp. 347–365); Control of the Webbing Clothes Moth (*Tinola biselliella*) by Hydrocyanic Acid Gas, by A. Andres (pp. 366–368); The Use of Insects in Medicine, by F. Heikertinger (pp. 369–373); *Thereva nobilitata*, a New Enemy of Rye, by Kleine (p. 373); and An Outbreak of *Orthezia insignis* at the Royal Botanical Garden at Berlin-Dahlem, by F. Schumacher (p. 374).

Insect pests of the rosella, E. Jarvis (*Queensland Agr. Jour., 12 (1919), No. 2, pp. 69–74, figs. 11*).—This paper deals particularly with the roselle flea-beetle (*Nisotra breweri*), which has found *Hibiscus subdariffa* more attractive than its own native food plant *Commersonia echinata*. While *N. breweri* is the only really destructive insect encountered by the author in Queensland at the present time, several other species also occur on the foliage of roselle at Meringa, namely *Lagris cyanea*, *Rhyparida discopunctulata*, *Euproctis* sp., *Dysdercus* sp., and *Agonoscelis rutilia*.

Common insecticides.—Their practical value, H. F. Wilson (*Wisconsin Sta. Bul. 303 (1919), pp. 15, figs. 5*).—The data presented in this bulletin are based upon a series of tests made by the author at the Oregon and Wisconsin experiment stations. These tests were made primarily to determine the comparative values of Paris green, arsenite of zinc, arsenate of lead, and calcium arsenate in the control of the Colorado potato beetle. The results are presented in tabular form, and a chart is given in which data relating to these insecticides are graphically compared.

In the course of the work 18 different arsenicals were examined, including both simple arsenicals and proprietary insecticides and the materials used in their manufacture. These are grouped in three classes: (1) Those having no killing efficiency (Prince's mineral, iron oxid, and silicia); (2) those having a slight degree of killing efficiency (basic lead sulphate, lead oxid, zinc oxid, and the compounds of zinc oxid plus lead oxid, and zinc oxid plus lead oxid plus iron oxid); and (3) those having a high degree of killing efficiency (Paris green, lead arsenate, calcium arsenate, zinc arsenite, Bug Death, Kling Kill, Tuber Tonic, and Insecto).

"Paris green and a special brand of lead arsenate gave the best results, with practically a 100 per cent killing efficiency within 24 hours. Ordinary arsenate of lead is second, and zinc arsenite and calcium arsenate are a trifle slower than the others. The materials known as Bug Death, Kling Kill, Tuber Tonic, and Insecto are proprietary compounds which contain as the active ingredient either lead oxid, zinc oxid, or some arsenical compound. They are, therefore, merely diluted combinations of poison and have no advantage over a good grade of arsenate of lead or calcium arsenate. Summarizing, Paris green is the material with the greatest killing efficiency, but it is little better than a certain brand of arsenate of lead. Ordinary brands of arsenate of lead, zinc arsenite, and calcium arsenate are a trifle slower in action, but are sufficiently efficient for all practical purposes for the control of the Colorado potato beetle."

On potatoes Paris green without lime was the only spray that caused any marked damage. On apple foliage it has been found that both calcium arsenate and Paris green cause injury to the foliage unless they are combined with equal parts of lime, lime-sulphur, or Bordeaux mixture, but when so combined no burning was detected.

Derris as an insecticide, N. E. McIndoo, A. F. Sievers, and W. S. Abbott (*Jour. Agr. Research [U. S.], 17 (1919), No. 5, pp. 177–200*).—This is a report of investigations of *Deguelia* [*Derris*] spp. as an insecticide, conducted coopera-

tively by the Bureaus of Entomology and Plant Industry of the U. S. Department of Agriculture. The results of the investigations are reported in part in tabular form and summarized as follows:

"Derris, known widely as a powerful East Indies fish poison, was found to fulfill several of the requirements of a general insecticide; it acts both as a contact insecticide and as a stomach poison, but is of no practical value as a fumigant. Six species of derris were tested, but only two of them (*D. illiptica* and *D. uliginosa*) were found to be satisfactory for insecticidal purposes.

"According to the views of various authors, the toxic principle in derris is a resin, which affects the various classes of animals according to the development of their nervous systems. It kills some insects easily and others with difficulty, but it usually acts slowly and seems to kill by motor paralysis. Denatured alcohol was found to be a good economic solvent for extracting the toxic principle, which when applied in spray mixtures proved to be efficient against certain aphids, potato beetle larvæ, and small fall webworms. For proprietary insecticides it is possible to incorporate the extracts from derris into soft soaps, which when greatly diluted with water are ready for use.

"Derris powder, used as a dust under practical conditions, was found to be efficient against dog fleas, chicken lice, house flies, three species of aphids (*Aphis rumicis*, *A. pomi*, and *Myzus persicæ*), potato beetle larvæ, and small fall webworms, but of no practical value against bedbugs, roaches, chicken mites, mealy bugs, *Orthezia insignis*, red spiders, or against the crawling young of the oyster-shell scale. Used as powder in water with or without soap under practical conditions, it proved to be efficient against most of the aphids sprayed and also against cabbage worms (*Autographa brassicæ*), the larvæ of apple datanas (*Datana ministra*), oak worms (*Anisota senatoria*), small tent caterpillars, and potato beetle larvæ."

A list of 11 references to the literature is included.

**Economic poisons used in control of pests in California, season 1917–18,** G. P. GRAY (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 3, pp. 109–112, fig. 1*).—Data presented in tabular form show the cost of economic poisons by counties and consumption, prices, and cost in 41 counties.

**Locust destruction** ([*Wellcome Trop. Research Lab.*] *Ent. Bul. 1 (1914), pp. 16*).—Directions are given for the control of locusts by means of arsenicals.

**The Coccobacillus acridiorum of d'Herelle,** D. S. S. QUIROGA (*Rev. Soc. Med. Vet. [Buenos Aires], 4 (1918), No. 1, pp. 467–479*).—This preliminary report to the Agricultural Commission of Defense includes a list of 16 references to the literature.

**Does Bordeaux mixture repel the potato leaf-hopper?** C. L. FLUKE, JR. (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 256, 257*).—The author presents data which indicate that the leaf-hopper is repelled to some extent by Bordeaux mixture, although further experimental work is necessary to prove such to be the case.

**The life history and biology of the pink and green aphid (Macrosiphum solanifolii),** L. B. SMITH (*Virginia Truck Sta. Bul. 27 (1919), pp. 27–79, figs. 12*).—This is a detailed report of investigations commenced in the spring of 1915 at Norfolk, in which region *M. solanifolii* is a serious enemy of potatoes and spinach, two crops of the greatest importance in eastern Virginia, the annual value of which is about $12,000,000.

In this paper the author deals particularly with certain phases of the life history and habits of *M. solanifolii* as it occurs in the region of Norfolk, together with some of its economic relationships, the literature on which is reviewed, including the studies of Patch (E. S. R., 34, p. 550), Houser et al. (E. S. R., 38, p. 462), Regan (E. S. R., 38, p. 654), Britton (E. S. R., 39, p. 761),

and others. Studies relating to the insect in its transmission of spinach blight have been previously noted (E. S. R., 39, p. 550).

The year 1917 is apparently the first time this species proved to be generally injurious over a large territory. In the Virginia trucking region injury to potatoes was first noticed in 1914. Outbreaks were more or less local in 1915, while the most severe outbreaks occurred during 1916, 1917, and 1918, varying from 1 or 2 to 75 or 80 per cent. It has been the source of considerable injury to young eggplant in cold frames and to the blossom and young fruit. Often its injury to tomatoes may occur chiefly on the blossom clusters and terminal shoots, the production of fruit being thus stopped; otherwise it resembles that to potatoes. During outbreaks of the green pea aphis (*M. pisi*) on peas in 1914 and 1915 the relative abundance of *M. solanifolii* varied from 13 to 42 per cent.

Although spinach has been severely injured by the attack of aphids for the past 12 or 15 years, the green peach aphis (*Rhopalosiphum persicæ*) has in the past probably caused the greater direct loss. During the past 5 years, however, the potato aphis has become numerous and in 1915, 1917, and 1918 serious outbreaks occurred on spinach during the fall and winter months. In those cases, while *R. persicæ* was present, over 90 per cent of the aphids infesting the crop were *M. solanifolii*. While it reduces both the yield and market value of spinach the greatest loss is caused through transmitting the spinach blight. The loss occasioned by this disease, transmitted by both *M. solanifolii* and *R. persicæ*, has been estimated to exceed $200,000 annually, which is approximately 20 per cent of the value of the entire crop.

In a study of its host plants it was found to feed and reproduce on 61 species representing 19 families. In the region of Norfolk it does not produce true sexes, the species passing the entire year as viviparous females. On the Eastern Shore peninsula the true sexes are produced occasionally, but are not common.

"Beginning about the first of March, there occurs a period lasting nearly six weeks when the aphids leave their winter host plants and colonize on a large variety of weeds, and also asparagus and potatoes. The aphids remain on asparagus only while the shoots are young and succulent. Potatoes are usually infested first when they are from 1 to 3 in. tall. The date depends largely on the prevailing climatic conditions. The general migration ceases about the first of May, although sporadic flights occur later. During the excessively hot weather, especially if it is dry, little movement takes place among the aphids.

"*M. solanifolii* is relatively abundant on various weeds until about July 1 to 15. Increased numbers of their natural enemies decimate the species, and during the late part of July and August they are exceedingly scarce and difficult to locate. Except when the aphids are sufficiently numerous to destroy the vines, there has not been observed any general migration from the spring crop of potatoes to other crops or weeds. It is believed that the offspring of individuals, which migrate to weeds early in the spring, are the ones which survive the summer.

"By the first of September the aphids are beginning to be more numerous on weeds, and an intermittent period of migration occurs which lasts until the weather becomes cold, usually about November 15. Young kale is occasionally heavily infested for a short period, but most of the aphids eventually find their way to spinach. Scattered individuals are to be found throughout the winter on certain of the Cruciferæ and Leguminosæ. The fall potato crop rarely suffers as severe injury as the spring crop. Outbreaks may occur on spinach at any time during the winter when the weather conditions are favorable. Hard,

driving rains and sleet storms are important factors in the natural control at this time of the year.

"Under average conditions, *M. solanifolii* is found associated with *R. persicæ* on spinach, but the former species is more numerous and widely distributed in the fields. Dispersal from plant to plant and field to field is accomplished by both the alate and apterous forms. The latter have been observed to travel several yards in order to reach a fresh food plant. The rate of infestation may be very rapid. In 1918 a 15-acre field of potatoes had 97 per cent of the plants infested within a period of 15 days. Other crops are likewise infested very rapidly.

"It has been observed that early maturing varieties of potatoes were the first to be infested in the spring, and suffer more serious injuries than do later maturing varieties. A variety of spinach has been obtained from Manchuria which is apparently distasteful to the aphids; at least, it is infested only when other food is scarce, or the aphids are extremely abundant. This strain is being used as the basis in our breeding experiments to obtain a blight-resistant strain. $F_1$ and $F_2$ hybrids of this strain are showing this character to a certain extent.

"Generation experiments were conducted from 1915 to 1918. Nineteen first born and eight last born generations, or an average of 13½ generations, were obtained between May 1 and November 20, 1915. Thirty-four consecutive first born generations were obtained between April 1, 1916, and April 1, 1917. The average age at which females gave birth to young was 10.9 days in 1915 and 11.1 days in 1916. The females mature at an earlier age during the summer than at other seasons of the year. The number of young born per day was found to vary, 12 being the maximum obtained. The maximum number of young produced during the life of a single female was 87. The averages were 43.3 in 1915 and 46.7 in 1916. The average life of a viviparous female was 29.2 days in 1915 and 32.6 days in 1916. The length of the reproduction period averaged 17.96 days in 1915 and 18.9 days in 1916. *M. solanifolii* molt four times; the average length of the instars was as follows: First, 54½ hours; second, 65½ hours; third, 69⅓ hours; fourth, 65⅔ hours.

"Two internal parasites of this aphid have been reared. *Aphidius polygonaphis* is most abundant; *Diaretus rapea* parasitizes this species occasionally. The common aphid fungus *Empusa aphidis* is one of the most important enemies of this aphid during the warm, humid periods of July and August. The two ladybird beetles *Hippodamia convergens* and *Megilla maculata* destroy many of the aphids during the spring and autumn."

A bibliography of 26 titles is appended.

**The durra asal fly (Aphis sorghi) in Dongola Province, Anglo-Egyptian Sudan**, H. H. King ([*Wellcome Trop. Research Lab.*] *Ent. Bul. 2 [1914], pp. 14*).—This is an account of the so-called asal fly of durra (*Sorghum vulgare*), the staple grain crop of the Sudan. In the northern Provinces of Sudan this fly confines its attention to durra and garowi (*Andropogon halepensis*) grown on or near the river banks but not on crops far distant from the river.

**Controlling mealy bugs by the use of their natural enemies**, H. M. Armitage (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 5, pp. 257–260*).—This is an outline of the work of the California State Horticultural Commission against the citrus-feeding mealy bugs in southern California.

**A new scale insect (Xylococcus alni) on alder, with special reference to its metamorphosis and anatomy**, K. Oguma (*Jour. Col. Agr. Hokkaido Imp. Univ., 8 (1919), No. 3, pp. 77–109, pls. 3, fig. 1*).—This is a report of studies extending over a period of several years of a new scale[1] which infests the branches of

[1] In *'O-yô-Konchiugaku*, edited by S. Matsumura (1917, vol. 1, p. 294).

alder (*Alnus japonica*) and is found in abundance in swampy places along the streams in Sapporo.

**New studies and observations of Argentine Pieridæ**, E. GIACOMELLI (*Physis, 3 (1917), No. 15, pp. 370–385*).—Thirty-nine species and 14 genera of this economic group are noted.

**Ear worm injuries to corn and resulting losses**, R. C. SMITH (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 229–233, pl. 1*).—In reviewing the injuries caused by the bollworm to corn it is pointed out that two sources of serious loss have been overlooked: (1) That due to its feeding on the germ or lower part of the kernel after the endosperm has hardened and (2) the entrance of grain weevils and other pests through the holes made by it in the husk.

**The status of the codling moth in its relation to the walnut industry**, D. B. MACKIE (*Mo. Bul. Cal. Com. Hort., 2 (1919), No. 5, pp. 250–256, figs. 3*).—This is an account of further work with the codling moth as an enemy of walnut, a brief account relating to which has previously been noted (E. S. R., 40, p. 456).

This pest is becoming a serious enemy of walnut in California, as high as 40 per cent of the entire crop being injured and sold as culls in certain orchards in Orange County. It appears that with cooperation the pest can be controlled in the field. The spread of this pest to orchards in sacks in which the worms spin their cocoons can be readily prevented through the use of the electric mangle at comparatively slight expense.

**Notes on lepidopterous borers found in plants, with special reference to the European corn borer**, E. MOSHER (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 258–268, figs. 4*).—This paper is prepared with a view to aiding field workers and others in determining whether or not they have the European corn borer at hand.

**Notes on the life history of the pine tube moth (Eulia pinatubana)**, A. HARTZELL (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 233–237*).—This is a report of studies made in the vicinity of Ithaca, N. Y., where the larva occurs in injurious numbers on white pine (*Pinus strobus*), which appears to be its only host plant. The species was first recorded in the United States by Comstock in 1880 and was confused with the European species *E. politana* until 1905, when it was described as new by Kearfott.

Tubes are built by the larvæ by drawing together leaves of the white pine with silk, from 5 to 20 leaves being bound together in their construction. Usually two or three of the leaves are left uneaten, which serve to hold the tube in place even after many of the older leaves are dead. The larvæ live singly, and it is thought probable that they may occupy more than one tube during the larval life. The author's observations indicate that the species is single-brooded in the latitude of central New York. The distribution of the species, though not well known, appears to be throughout the white-pine district of southern Canada and eastern United States.

Records are given of rearings of 25 individual parasites representing 8 species of Hymenoptera, the identifications of which were made by Girault, Cushman, and Rohwer.

**What hinders dried fruit sales?** E. R. DE ONG (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 5, pp. 240–243, figs. 4*).—A brief discussion of the infestation of dried fruit by the Indian meal moth.

**Observations on the food of Anopheles larvæ**, C. W. METZ (*Pub. Health Rpts. [U. S.], 34 (1919), No. 32, pp. 1783–1791*).—The author reports studies conducted in the summer of 1918 near Montgomery, Ala., and Lakeland, Fla., which deal with *Anopheles punctipennis, A. quadrimaculatus*, and *A. crucians*,

especially the two last named. The experiments show that the diet of Anopheles larvæ may be either heterogeneous or homogeneous, consisting of mixed animal and vegetable materials, mixed vegetable materials, or individual species of plants or animals.

Some aspects of malaria control through mosquito eradication, C. W. METZ (*Pub. Health Rpts. [U. S.], 34 (1919), No. 5, pp. 167–188, figs. 4*).—This discussion relates to drainage, oiling, and accessory measures.

The experimental infection in England of Anopheles plumbeus with Plasmodium vivax (sporoboites in salivary glands), B. BLACKLOCK and H. F. CARTER (*Ann. Trop. Med. and Parasitol., 13 (1919), No. 2, pp. 187, 188*).—Two of five mosquitoes fed on a volunteer patient suffering from simple tertian malaria acquired in Saloniki were found to be infected. In the first, which died, 12 oöcysts were found in the gut, some being in an advanced state of development. The other was killed and infections of bot gut and salivary glands were found. Both glands were infected with sporozoites in large numbers, the distal extremities of the lobes being chiefly involved. Thirty-six oöcysts varying in size from 18 to 30 μ have also been obtained in the gut of a female killed on the thirteenth day after the infective feed and kept at laboratory temperature.

Variations in the length of the flaxseed stage of the Hessian fly, J. W. MCCOLLOCH (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 252–255*).—The author finds in rearing 7,461 flies in Kansas from collected material that the average time between collection and emergence was 113.2 days, with extremes of 2 and 1,083 days. It was found that 68.4 per cent emerged during the first month and 98.9 during the first year, while 1.1 per cent did not emerge until after the first year although subject to the same conditions. One Hessian fly from a clump of wheat collected May 8, 1915, emerged May 7, 1919. Allowing approximately a month for the fly to reach the flaxseed stage, this gives a life cycle of 49 months.

The white grub or grass root beetle (Scitala pruinosa), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 30 (1919), No. 7, pp. 505–508, figs. 2*).—This species, which has an extensive range along the southern and eastern coast of Australia, often destroys large areas of cereal crops and grass.

Observations on wingless May beetles, R. A. VICKERY and T. S. WILSON (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 238–247, pls. 2*).—These observations relate to *Lachnosterna cribosa* and *L. fareta* in Texas, where they caused serious damage to crops during the spring of 1918.

Experimenting with ladybugs (*Better Fruit, 14 (1919), No. 1, p. 14*).—It is reported that 300 lbs. of ladybird beetles stored at Walla Walla, Wash., during the winter and spring had been liberated in the fruit-growing districts of that section up to June 5. It is estimated that they would cover 2,000 acres of orchards and grain fields. District horticultural agent E. C. Wood reports that the beetles begin to colonize in the mountains in July and remain in colonies during the winter, and can be gathered for a considerable period in the fall and for a period of 10 days during the month of April. In experiments in keeping the ladybird beetles in storage during the winter, those kept in ordinary storage showed a loss of about one-third, while those kept in cold storage showed practically no loss at all.

Japanese flower beetle, W. H. GOODWIN (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 247–252*).—This is a brief discussion of the occurrence of *Popillia japonica* in New Jersey. Details are given of the eradication work being carried on in the infested territory, which lies between Moorestown and Riverton and at present covers some four or five thousand acres of very productive sandy loam farms.

Should we dust cotton to control the boll weevil? W. E. Hinds (*Ala. Polytech. Inst. Ext. Serv. Circ. 31 (1919), pp. 35–42*).—The conditions under which dusting cotton can and can not profitably be followed are pointed out.

How weevils get into beans, E. A. Back (*U. S. Dept. Agr. Yearbook 1918, pp. 327–334, pls. 3*).—A popular illustrated discussion.

A source of confusion in the diagnosis of Nosema apis in adult bees, A. P. Sturtevant (*Jour. Econ. Ent., 12 (1919), No. 3, pp. 269, 270*).—The author calls attention to the fact that the starch granules from the pollen grains of corn and most of the cereals closely resemble the spores of *N. apis*.

Bembecia hylæiformis and Sesia tipuliformis, N. A. Kemner (*K. Landtbr. Akad. Handl. och Tidskr., 58 (1919), No. 2, pp. 69–84, figs. 15; also in Meddel. Centralanst. Försöksp. Jordbruksområdet, No. 181 (1919), pp. 18, figs. 15*).—A report of studies of these two species and their occurrence in Sweden. A list of 26 references to the literature is included.

A revision of the chalcid flies of the genus Harmolita of America, north of Mexico, W. J. Phillips and W. T. Emery (*Proc. U. S. Nat. Mus., 55 (1919), pp. 433–471, pls. 10*).—In this revision of the genus Harmolita (Isosoma of the authors), which includes some species of very great economic importance, 29 species are recognized, of which 17 are described as new to science.

The species described as new are *Harmolita poæ*, reared from the seed stalks of blue grass (*Poa pratensis*) at Richmond and Lafayette, Ind.; *H. dactylicola*, reared from orchard grass (*Dactylis glomerata*) collected in Indiana, Ohio, Michigan, New York, Pennsylvania, and Virginia; *H. agropyrophila*, reared from stems of *Agropyron* sp. collected in eastern Kansas, Indiana, Ohio, Michigan, New York, and Pennsylvania; *H. rufipes*, reared from stems of species of Elymus collected in Illinois, Kansas, Nebraska, Utah, and New Mexico, in internodes of which it forms inconspicuous galls; *H. festucæ*, which breeds and forms galls in species of Festuca in New York, Ohio, and Virginia; *H. hesperus*, which forms galls in species of Elymus in Utah, the Dakotas, Nebraska, and Kansas; *H. agropyrocola*, reared from species of Agropyron collected near Salt Lake City; *H. ovata*, reared from species of Elymus from Wellington, Kans.; *H. elymoxena*, reared from *Elymus americanus* from Santa Cruz Mountains, Cal.; *H. elymicola*, reared from stems of species of Elymus collected in Indiana and Virginia; *H. atlantica*, reared from stems of species of Agropyron collected in New York, Pennsylvania, Ohio, Indiana, and Michigan; *H. elymophila*, described from specimens forming galls on Elymus at Alameda, Cal.; *H. poophila*, reared from galls in *Poa lucida* collected at Husted, Colo.; *H. elymivora*, reared from stems of species of Elymus collected in Arkansas, Kansas, Illinois, Indiana, Ohio, and Virginia; *H. elymophthora*, reared from stems of species of Elymus in North Dakota and Nebraska; *H. occidentalis*, reared from inconspicuous galls on stems of species of Agropyron collected in New Mexico and Kansas; and *H. gillettei*, collected near Glenwood Springs, Colo.

## FOODS—HUMAN NUTRITION.

Changes in food value of vegetables due to cooking, M. C. Denton (*Jour. Home Econ., 11 (1919), Nos. 4, pp. 143–154; 5, pp. 200–209*).—Results of her extended investigations are summarized by the author as follows:

"Boiled vegetables may lose as low as 15 per cent or as high as 60 per cent of their fuel value, according to the method of manipulation. Those vegetables which are cooked within their own heavy, intact jackets, such as unpeeled Irish potatoes and beets, will of course lose much less even than this minimum.

The extent of the loss depends upon the amount of soluble carbohydrate and protein present in the vegetable tissues, as well as upon the manipulation.

"Losses in salts and nitrogen often, if not always, slightly exceed the fuel or caloric losses. Blanching for 5 or 6 minutes causes losses of 8 to 15 per cent in salts or fuel value. Peeled and sliced vegetables lose twice as much. Salting the water (1.5 per cent solution, or about 1 tablespoon to the quart) decreases the losses in fuel value due to boiling. Cutting the vegetable crosswise instead of lengthwise, or into small instead of large pieces, increases the losses.

"Steaming usually cuts the caloric losses down almost to zero; also the salt losses, except in case of leafy tissues, such as cabbage or spinach, which expose a very large amount of surface to the action of the condensing vapor. However, if conditions within the steamer are such that water washes down over the vegetable mass, steaming may cause very large losses. Particularly is this the case with pressure steamers. The two factors most potent in causing variations in cooking losses are varying lengths of time of cooking, and varying amounts of water used in proportion to mass of vegetables to be cooked.

"Steamed vegetables always lose in weight. Boiled vegetables may gain in weight because their intercellular spaces take up water at the same time that they are losing heavily in mineral salts and soluble carbohydrates and proteins.

"Home canning often results in a maximum amount of vegetables and a minimum amount of watery juice in the jar, partly because of close packing and partly because liquid is driven off during the period of processing with the seal only partially made. This relatively small amount of juice in the jar is a great advantage from the standpoint of true nutritive economy—whatever may be its effect upon ease of sterilization of the vegetable mass."

**Effect of pack and depth of water bath upon interior temperature of jars in cold pack canning,** C. E. CASTLE (*Jour. Home Econ., 11 (1919), No. 6, pp. 246–251, fig. 1*).—Summing up the evidence which this and previous investigations have afforded, the following conclusions are drawn:

"The completeness of sterilization of vegetables packed in glass jars and heated in a water bath for one hour on three successive days, counting time from the beginning of boiling of the water-bath, is questioned. The water-bath should completely immerse the jars, and should be brought to the boiling point after immersion of the jars. When a water-bath method is used very great care should be exercised in the pack. Loosely packed jars only should be used in canning by usual home methods. Home-canned vegetables, particularly solid packed jars, should always be heated before use to avoid the danger of poisoning by the toxin of *B. botulinus*, the spores of which are exceedingly resistant to heat."

**The supposed occurrence of methylguanidin in meat, with observations on the oxidation of creatin by mercuric acetate,** I. GREENWALD (*Jour. Amer. Chem. Soc., 41 (1919), No. 7, pp. 1109–1115*).—In the course of an investigation of the nature of the toxic agent in meat poisoning, sufficient evidence was obtained to demonstrate that methylguanidin is not present in meat that is in a fair state of preservation. Since "meat poisoning" is due to meat that is not badly decomposed, the conclusion is drawn that methylguanidin can not be regarded as the toxic agent.

The author has also confirmed the conclusions of Baumann and Ingvaldsen[1] that the oxidation of creatin by mercuric acetate yields methylguanido-glyoxylic acid.

**Nature of the toxic agent in "meat poisoning,"** I. GREENWALD (*Amer. Jour. Pub. Health, 9 (1919), No. 8, pp. 595–598*).—The author reports negative results

[1]Jour. Biol. Chem., 25 (1918), No. 2, p. 277.

in feeding experiments devised to demonstrate the presence of a heat-stable toxin in meat inoculated with various strains of bacteria, including *B. enteritidis*, *B. putrificus*, *B. botulinus*, *B. fecalis alkaligenes*, *B. proteus*, and *B. paratyphosus* B. Rats, mice, and guinea pigs were used as experimental animals.

The failure to demonstrate the presence of a heat-stable toxin is considered to be due possibly to the choice of the experimental animals or to the low virulence of the strains used. The occurrence of organisms capable of producing strongly heat-stable toxins is, however, thought to be very rare. The author considers that the rapid development of the symptoms of meat poisoning is due to a heat-labile toxin, and that further study of the problem should take the direction of an investigation of such toxins.

**Composition and food value of bottled soft drinks**, J. W. Sale and W. W. Skinner (*U. S. Dept. Agr. Yearbook 1918, pp. 115–122*).—This article describes briefly the ingredients of some of the standard types of bottled soft drinks. Investigations by the authors on the use of sugar substitutes in bottled soft drinks have been previously noted from another source (E. S. R., 40, p. 68).

**[Miscellaneous food and drug topics]**, E. F. Ladd and A. K. Johnson (*North Dakota Sta. Spec. Bul. 5 (1919), Nos. 10, pp. 219–263; 11, pp. 242–257*).—The first of these numbers contains tabulated results of the sanitary inspection of 2,755 food-producing or distributing establishments. The second consists of data as to feeding stuffs noted on page 673, and an article on Precipitates in Bottled Soda Water, by C. P. Guthrie.

**Budget planning in social case work**, E. A. Winslow (*Charity Organ. Soc. N. Y. Com. Home Econ., Bul. 3 (1919), pp. 31*).—This account of budget planning, which represents the work of the committee on budget methods and standards, it is believed will help case workers to give more efficient service.

**The nutritional standards of adolescence**, G. Lusk (*Jour. Home Econ., 11 (1919), No. 7, pp. 281–287*).—In this paper, presented at the U. S. Children's Bureau conference on child welfare standards, in Washington, May, 1919, the subject is discussed on the basis of information accumulated during the war, as well as other data.

**Importance of animal proteins and fats in human nutrition**, F. Bottazzi (*Bul. Soc. Sci. Hyg. Aliment., 7 (1919), No. 4, pp. 179–193*).—The author discusses the relative value of proteins and fats from animal and from vegetable sources. In his opinion a well-balanced ration should contain at least from 20 to 25 per cent of its total calorific value in fat (in agreement with the recommendation of Starling (E. S. R., 40, p. 170), and this ration of fat should not be composed exclusively of vegetable oils or the storage or depot fat of animals, but should contain a certain amount of the fat of active organs on account of their special lipoids and vitamins. It is also recommended that from one-third to one-half of the total protein be obtained from animal sources, either meat or visceral organs. A certain amount of the latter is recommended as furnishing both proteins and the special fats, the necessity of which is emphasized.

**Physiological basis of rationing.—Importance of the fat-protein ratio.—Minimum of fat necessary**, F. Maignon (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 12, pp. 400, 401*).—This is a further discussion of conclusions previously drawn that a minimum of fat in the diet is necessary and that the fat-protein ratio should be at least equal to unity. The author summarizes the food requirements of adults as follows: (1) A quantity of protein sufficient for the repair of the tissues; (2) the minimum of fat necessary for the economical and nontoxic utilization of this amount of protein; and (3) an amount of carbohydrate corresponding to the energy expended in physiological work.

The fat-protein ratio is considered to be of the greatest importance, as the utilization of nitrogen is thought to depend upon this ratio. It is pointed out that this ratio approaches unity in eggs and in whole milk, and is about 9:8 in meat. It is suggested that the partial skimming of milk not only results in a diminution of the nutritive power of this food but by altering the fat-protein ratio may cause a toxic utilization of its protein.

**A study of the mechanism of the action of fats in the utilization and assimilation of proteins,** F. MAIGNON (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 9, pp. 474–476*).—To explain the favorable influence of fats upon proteins in diminishing their toxicity and increasing their nutritive value (E. S. R., 40, p. 463), the theory is proposed that after hydrolytic cleavage in the body the fatty acids may unite with certain amino acids with the formation of specific proteins. In this way amino acids which would not be utilizable otherwise are made available instead of forming toxic products.

**Maintenance ration.—Function of carbohydrates,** H. BIERRY (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 15, pp. 530–533*).—The author criticises the work of Maignon, particularly on the rôle of fats and carbohydrates in metabolism noted above, and suggests that the apparent contradictions between his experimental results and those of other workers are due to the fact that the proteins and fats used by Maignon were not pure, but contained carbohydrates and more or less of the accessory factors fat-soluble A and water-soluble B.

In conclusion, the author emphasizes that a maintenance ration must contain a certain quantity of carbohydrates, the amount depending upon the chemical structure and function of the carbohydrates in question and of the other food materials which enter into the composition of the ration.

**A new conception of the rôle of various food constituents in nutrition.—Observations on the researches of Maignon,** E. F. TERROINE (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 16, pp. 574–578*).—The author agrees with the statements of Bierry noted above and further criticises the work of Maignon, concluding that sufficient evidence has not been furnished to establish the superiority of fats over carbohydrates as protein sparers.

**Critical study of the influence exercised by lack of vitamins on the feeding experiments with pure products which have established the rôle of fats in the utilization of proteins,** F. MAIGNON (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 12, pp. 398, 399*).—The author is of the opinion that in his researches on the rôle of carbohydrates and fats in nutrition, noted above, the lack of vitamins in the experimental rations has not falsified the results obtained, since the experiments reported were conducted during the latent period in which the vitamins of the tissues were able to make up for the deficiency in food vitamins.

**The absence of fat-soluble A vitamin in certain ductless glands,** A. D. EMMETT and G. O. LUROS (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 441–447, figs. 5*).—The authors report the absence of fat-soluble A in the fats obtained from the pancreas, thymus, and suprarenal glands by extraction with either acetone or benzine. A table is given which summarizes the presence or absence of fat-soluble A in food substances as based on published results.

**The vitamin requirement of yeast,** R. J. WILLIAMS (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 465–486, pl. 1*).—From direct microscopic observation of the growth of individual yeast cells in sterile synthetic salt solutions to which small amounts of the material to be tested had been added, evidence is presented that the water-soluble, beri-beri-preventing vitamin is necessary for the nutrition of yeast cells themselves. Growth of the yeast cells was hastened and greatly increased by the presence of a small amount of the alcoholic extracts of "protein-free" milk, wheat germ, lactose, and pancreas tissue, by

fuller's earth activated by malt wort, and by the phosphotungstic acid precipitate of the vitamins from activated fuller's earth. No increase in growth was produced by hydrolyzed casein or by the extract of fat-soluble vitamin from egg yolk. These results indicate the identity of the substance necessary for the growth of yeast with the water-soluble vitamin.

Further light is thrown on the properties of the water-soluble vitamin by some of the experiments reported. It was found that the growth-promoting substance obtained from an alcoholic extract of dried yeast was partially destroyed by heating under 15 lbs. pressure for 30 minutes. The fuller's earth preparation, as well as the alcoholic extracts of yeast and wheat germ, was found to be quite stable in alkaline solution, thus confirming the observations of R. R. Williams and Seidell (E. S. R., 36, p. 314). The material, when acted on by acid or alkali, appeared to be changed (presumably by hydrolysis) to a form more immediately available for the yeast. A previous exhaustive extraction of the substance with dry ether is thought to render the alcoholic extract obtained afterwards more labile to alkali. This would seem to offer a partial explanation for the divergence of results in stability of the vitamin toward alkali as reported by various observers.

It is the opinion of the author that the method employed in this investigation may be valuable both as a qualitative and ultimately as a quantitative test for the water-soluble vitamin. The advantages in its use are that extremely small amounts of material may be used, and that the vitamin may be detected in the course of only 4 or 5 hours.

**The connection between food régime and illness**, L. B. Mendel (*Bul. Soc. Sci. Hyg. Aliment., 7 (1919), No. 4, pp. 194–198*).—A popular discussion of vitamins and deficiency diseases.

## ANIMAL PRODUCTION.

**Live stock and reconstruction**, G. M. Rommel (*U. S. Dept. Agr. Yearbook 1918, pp. 289–302*).—Live-stock statistics of the United Kingdom and of France before and during the European War are tabulated and discussed. Pigs and sheep were reduced considerably in numbers, but apparently only the sheep situation was causing uneasiness. Very little pure-bred stock has been sacrificed because of feed shortage. The author anticipates no extensive importations of breeding stock, except perhaps horses, from the United States or from any other country. The function of American live-stock interests during the reconstruction period will be to furnish Europe with meat and dairy products, so that European farmers can devote their energies to increasing the number of breeding animals from the supply at hand.

**Cattle raising and the meat industry in southern Brazil**, R. Porchat (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 591–596*).—Statistical information on cattle raising and packing-house industries in the southern States of Brazil are presented.

**French live stock after three years of war**, A. Massé (*Le Troupeau Français après Trois Ans de Guerre. Paris: Min. Agr., 1918, pp. 287*).—This is a report to the Minister of Agriculture, dated October 1, 1917, of the live-stock situation in France. Tables present the numbers of bulls, steers, cows, calves, rams, ewes, wethers, lambs, boars, sows, and young pigs in the country as a whole on December 31, 1913, on December 31, 1914, and semiannually thereafter through June 30, 1917. Similar data for less frequent intervals are given for each of the 87 departments. The means taken to conserve live stock in war time are briefly explained.

**Government market reports on live stock and meats**, J. ATKINSON (*U. S. Dept. Agr. Yearbook 1918, pp. 379–398*).—The activities and policies of the Bureau of Markets in making periodical reports on fresh and stored meats and on live-stock shipments are explained, and illustrated by sample reports. The value of publicity in these matters, both to producers and to consumers, is pointed out.

**Saving of meat-storage and shipping space** (*Jour Agr. [New Zeal.], 15 (1917), No. 1, pp. 16–19, figs. 4*).—A space-saving method of preparing mutton carcasses is reported. The carcass is hung by the fore-legs and the hind part cut off just behind the saddle and inserted in the thoracic cavity.

**Country hides and skins**, C. V. WHALIN, R. W. FREY, F. P. VEITCH, and R. W. HICKMAN (*U. S. Dept. Agr., Farmers' Bul. 1055 (1919), pp. 64, figs. 46*).—This is a joint contribution from the Bureaus of Markets, Chemistry, and Animal Industry, and its main purpose is to provide farmers and small butchers with detailed directions for the skinning, salting, curing, shipping, and marketing of hides and skins. The market classes and grades of both packer and country hides and skins are also defined, and the main defects of country hides and skins, and the economic waste resulting from faulty practices, are indicated. Statistical information in tabular and graphical form as to market prices and price fluctuations is included in an appendix.

**Tandler and Keller on the freemartin**, F. R. LILLIE (*Science, n. ser., 50 (1919), No. 1286, pp. 183, 184*).—Attention is called to the fact that J. Tandler and K. Keller in a brief paper[1] published in 1911 anticipated certain of the author's observations (E. S. R., 40, p. 466), first announced in 1916, by finding that twin cattle fetuses are inclosed in a common chorion and generally have a joint circulatory system (as shown by examination and injection), and that if the twins are of opposite sexes and their vascular systems are united the female has typical freemartin genital organs.

**Creatin excretion in ruminants**, J. B. ORR (*Biochem. Jour., 12 (1918), No. 3, pp. 221–230*).—The author reports the creatin, creatinin, and total nitrogen excreted (1) by an ewe not in milk, a he-goat, and a lactating she-goat under normal feeding conditions (hay, oats, bran, and turnips) and (2) by another she-goat in both a lactating and a nonlactating condition during similar mixed feeding and during high carbohydrate feeding (potatoes).

During normal mixed feeding the creatin excretion of this latter doe was 0.51 gm. per day when in milk, and 0.14 gm. when dry. After several days of potato feeding no creatin appeared in the urine even during lactation, although the milk yield diminished. The creatinin remained approximately constant—about 0.9 gm. per day—throughout the change in feed, and was the same in the lactating as in the nonlactating stage.

These experiments are compared with observations of workers who have made the reverse experiment and found creatin in the urine following carbohydrate privation in the case of animals that do not ordinarily excrete it. It is held that the body tissues constantly produce creatin from some source other than protein, either endogenous or exogenous, and that this creatin is utilized in connection with carbohydrate metabolism.

**On several effects of feeding small quantities of Sudan III to young albino rats**, S. HATAI (*Jour. Expt. Zool., 26 (1918), No. 1, pp. 101–117, figs. 3*).—Month old rats were fed Sudan III (Grübler's), dissolved in olive oil, for upwards of 80 days. Litter mates furnished the controls in each series, 135 young from 19 litters being the total experimented with.

[1] Deut. Tierärztl. Wchnschr., 19 (1911), No. 10, pp. 148, 149.

In all cases the dye-fed individuals were underweight and anemic; olive oil alone did not produce any such effects. Autopsy showed an increase in weight of the liver and pancreas of the experimental animals, and a decrease in the thymus, testes, and ovaries. The rapidity of the thymus atrophy was apparently proportional to the amount of Sudan III administered. There was an increase of the water content in the blood, lungs, and pancreas, and a decrease in the liver, spleen, kidneys, brain, and heart. Previous workers have in general failed to note a growth-retarding influence of Sudan III, but it is pointed out most of the animals used in similar investigations have been adults.

The dye was not detected in the brain or in any of the other organs examined except for slight traces in the liver, pancreas, lungs, and kidneys. This result is interpreted to mean that the organ lipoids are endogenous in origin.

**Behavior of Sudan III in the animal organism**, B. E. Read (*Jour. Biol. Chem., 37 (1919), No. 1, pp. 121–135*).—Commercial samples of Sudan III fed to adult rabbits and white rats in relatively large doses caused debility, convulsions, and death. A sample purified by repeated crystallization out of hot glacial acetic acid and fed in conjunction with a mixed diet was not toxic to a rabbit. The author attributes Hatai's results (noted above) to impurities in the dyes used.

The results of Mendel and Daniels (E. S. R., 27, p. 670), with respect to the presence of the dye in the lymph, bile, and blood, and its absence from the urine after Sudan III feeding, were confirmed by experiments with six dogs. When the commercial dye was fed to rabbits, the urine frequently contained a brown-red pigment, which was not, however, Sudan III and which is thought to have been a by-product of impurities in the dye. It is held that the presence of a similar pigment led Salant and Bengis (E. S. R., 36, p. 262), to the view that Sudan III is eliminated through the kidneys.

**Definitions of feeding stuffs adopted by the Association of Feed Control Officials of the United States**, A. W. Clark (*Geneva, N. Y.: Sec. Assoc. Feed Control Off., 1918, pp. 4*).—This leaflet is a compilation of 59 official and 13 tentative definitions of feeding stuffs adopted by the Association of Feed Control Officials, and includes the changes authorized at the annual meeting held January 13 and 14, 1919 (E. S. R., 41, p. 564).

**Feeding stuffs—definitions** (*North Dakota Sta. Spec. Bul., 5 (1919), No. 11, pp. 248–254*).—A reprint of the above.

**Stock foods**, E. F. Ladd and A. K. Johnson (*North Dakota Sta. Spec. Bul., 5 (1919), No. 11, pp. 243–248*).—These pages include a protest against "patent medicines for animals," a reference to analytical work of the station on condimental feeds (E. S. R., 39, p. 70), excerpts from Wisconsin Station Bulletin 151 (E. S. R., 19, p. 464), and a reprint with the omission of the introductory paragraph of a report from the Massachusetts Station (E. S. R., 24, p. 269) on the value of such feeds.

**Heavy and light grain rations when fed in connection with corn silage and clover hay for fattening steers**, H. O. Allison (*Missouri Sta. Bul. 163 (1919), pp. 22–24, figs. 2*).—Five lots of 8 two-year-old steers were fed for 100 days beginning December 18, 1917. Lot 1 received a full feed of corn and linseed meal (6:1) and made an average daily gain of 3.05 lbs. per head. Lot 2 receiving half as much corn gained 2.37 lbs. per head daily, lot 3 with corn during last 40 days only, gained 2.45 lbs., and lot 4 with no corn 2.36 lbs. Lots 2, 3, and 4 each received as much linseed meal as lot 1. Lot 5 with no corn and 5 lbs. of linseed meal daily per head made a daily gain of 2.29 lbs. The preceding experiments in this series were reported in Bulletin 150 (E. S. R., 38, p. 272).

Cattle loans and their value to investors, C. S. COLE (*U. S. Dept. Agr. Yearbook 1918, pp. 101–108*).—The activities of cattle loan companies, the procedure in making a loan, the factors influencing the size of the loan, the interest and rediscount rates, and the advantages of the system to buyers of cattle paper, to borrowers on cattle security, and to the cattle industry as a whole are briefly explained.

[Swine feeding investigations] L. A. WEAVER (*Missouri Sta. Bul. 163 (1919), pp. 21, 22, 27–31, figs. 4*).—The methods used in three swine feeding projects are outlined, and brief accounts are presented of the experimental results.

*The influence of different systems of management upon the cost of producing pork* (pp. 21, 22).—A lot of 73 34-lb. weanling pigs were fed a full ration of shelled corn, shorts, and tankage (9:2:1) while on pasture for 119 days beginning June 16, 1917. They were then fed in dry lot until an average weight of 202.6 lbs. was attained, which required 42 more days. A second lot was kept on pasture throughout the grazing season (155 days) and during this time received a ration of concentrated feed equal to half of that consumed by lot 1. They were then full fed until they had reached an average weight of 204.8 lbs. per head, i. e., for 53 more days. The average daily gain of the full feed lot was 1.05 lbs. and that of the half feed lot 0.82 lb. per head. The amounts of concentrated feed required for a pound of grain averaged 3.95 and 4.09 lbs., respectively.

*Maintenance of brood sows* (pp. 27–29).—In an experiment begun in December, 1916, with 6 lots of 7 Poland China gilts each, farrowed in March and April, the following rations were compared with respect to the number, size, and health of the young produced: (1) corn, tankage, alfalfa hay, 10:1:6; (2) corn, tankage, clover hay, 10:1:5; (3) corn, tankage, 10:1; (4) corn, linseed meal, 5:1; (5) corn, shorts, tankage, 8:2:1; and (6) corn, shorts, bran, tankage, 8:4:1:1. An attempt was made to keep the lots uniform in weight. The lot fed ration 6 produced in the spring of 1917 7.85 pigs per sow, the largest number of any lot, but the average birth weight was the lowest, being 2.48 lbs. per pig. The highest average birth weight (2.79 lbs.) occurred in lot 4. Lot 1 had the largest percentage of weak and dead pigs (41.9), and lot 4 the lowest, (12.2).

Lot 5 was discontinued in 1917 and the number of sows in each of the other lots was reduced to 6. During 1917 and 1918 blue grass was added to rations 3, 4, and 6, while rye forage and rape forage replaced clover hay in ration 2. The second litters in each lot were larger than the first, and again lot 6 produced the most pigs per sow. Lot 1 produced the heaviest pigs (2.78 lbs.) and lot 4 the lighest (2.09 lbs.). Lot 3 had the smallest proportion of weak and dead pigs (5.26 per cent) and lot 6 the largest (24 per cent).

*Relation of better preparation of feed stuffs and different methods of feeding upon the rate and economy of gain put on by fattening swine* (pp. 29–31).—A 98-day feeding trial was begun December 21, 1917, with 72 Poland China shotes divided into 5 lots. Four lots were fed corn, shorts, and tankage (9:2:1), while the fifth had free choice of these feeds in a self-feeder and selected them in the proportions of 16.25:1.58:1. Corn for one of the hand fed lots was shelled, whereas that for the other lots was ground. The hand-fed lots got corn twice daily and the balance of the ration was fed as a slop either once or twice daily. Grinding the corn and feeding the slop both morning and evening improved the gains. In addition to the regular hand-feeding twice a day, one lot had constant access to the mixed feeds in a self-feeder; they became fatter than the other lots but the gain was the most expensive.

The free choice self-fed hogs required the least feed (4.63 lbs.) per pound of gain and, because of the small amount of tankage consumed, their gains were the cheapest.

**Can hogs be raised at a profit at the present level of prices?** (*Bul. Nebr. Bd. Agr., No. 245 (1918), pp. 344–348*).—A 60-day feeding experiment at the Nebraska Experiment Station, beginning July 18, 1917, with 5 lots of 12 hogs, is reported. Two lots were used to compare rape and alfalfa pastures when corn and semisolid buttermilk were fed as concentrates. The others provide a basis for comparing corn and hominy feed when self fed with tankage on alfalfa pasture. A comparison between semisolid buttermilk and tankage when combined with corn and alfalfa pasture is also possible. The main results follow:

*Comparison of supplements to pasture in fattening shotes.*

| Lot. | Pasture and method of feeding. | Initial weight per head. | Daily gain per head. | Feed consumed per pound of gain. | | | | Selling price per pound. | Profit per head. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Corn. | Hominy feed. | Tankage. | Semisolid buttermilk. | | |
| | | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lb.* | *Lb.* | *Cents.* | |
| 1 | Rape hand feeding | 105.8 | 1.97 | 3.53 | ..... | ..... | 0.711 | 17.75 | $4.51 |
| 2 | Alfalfa hand feeding | 108.9 | 2.14 | 3.29 | ..... | ..... | .662 | 17.90 | 6.50 |
| 3 | Alfalfa self-feeder | 105.4 | 1.94 | 3.44 | ..... | 0.183 | ..... | 17.74 | 6.81 |
| 4 | Do | 104.4 | 1.60 | ..... | 3.41 | .223 | ..... | 17.60 | 5.75 |
| 5 | Do | 105.7 | 1.79 | 2.23 | 1.19 | .191 | ..... | 17.80 | 6.71 |

The prices charged were: Corn $2 a bushel, buttermilk 3.5 cts. a pound, and tankage $80, and hominy feed $70 per ton. The daily pasture charge was 0.5 ct. per head.

Lot 4 carried the least finish of any lot, although they seemed to relish the hominy feed. Lot 5, with access, free choice to corn and hominy feed, finished better than lot 3, but made slower gains and a lessened profit. "From the standpoint of the man who desires to force his pigs, undoubtedly the corn and buttermilk deserves considerable consideration, and its utilization, especially in the crowding of purebred pigs for sale, should not be ignored."

**Corn and cob meal, linseed meal, and oat straw as a wintering ration for farm work horses,** E. A. Trowbridge (*Missouri Sta. Bul. 163 (1919), pp. 24–27, figs. 4*).—To study the possibilities of a winter ration for work horses with oat straw as a basis, 8 Percheron mares were fed for six weeks beginning January 11, 1918, on a ration consisting of corn and cob meal, linseed meal, and oat straw, and were then fed for three weeks on a similar ration in which clover and timothy hay replaced the straw. The former ration was as satisfactory as the latter.

**Poultry-feeding tests at Milton,** F. C. Brown (*Jour. Agr. [New Zeal.], 16 (1918), No. 6, pp. 331–333*).—Tests are reported with White Plymouth Rocks and Black Orpingtons similar to those previously noted (E. S. R., 38, p. 71) with Leghorns. With these breeds also it is found that satisfactory egg records can be secured when whole oats is fed in place of wheat and alfalfa meal replaces shorts in the mash.

**Better poultry through community breeding associations,** J. W. Kinghorne (*U. S. Dept. Agr. Yearbook 1918, pp. 109–114, pls. 4*).—This is a brief discussion of the purposes and activities of community poultry breeders' associations.

It is held that the most potent factor in the success of such an organization is concentration on a single breed. Commonly adopted methods of financing

the association at the start and of inducing members to replace their unimproved birds with standard-bred poultry are outlined.

**Standard varieties of chickens.—III, The Asiatic, English, and French classes**, R. R. SLOCUM (*U. S. Dept. Agr., Farmers' Bul. 1052 (1919), pp. 31, figs. 31*).—Brief characterizations, similar to those in previous publications of this series (E. S. R., 38, p. 373) are given of the Brahma, Cochin, Langshan, Dorking, Red Cap, Orpington, Cornish, Sussex, Houdan, Crèvecœur, La Flèche, and Faverolle breeds and their recognized varieties. It is pointed out that these are predominantly table fowl.

**Chickens**, L. GÖTTING (*Las Gallinas. Mexico: Sec. Fomento, Dir. Agr., 1917, rev. and enl. ed., pp. 102*).—This manual covers briefly the classification, housing, incubation, breeding, feeding, and diseases of the domestic fowl. Particular attention is given to systematic record-keeping and the planning of matings.

**Rabbit growing to supplement the meat supply**, N. DEARBORN (*U. S. Dept. Agr. Yearbook 1918, pp. 145–152, pls. 2, fig. 1*).—Several instances are noted where the growing of domestic rabbits for meat in the United States has proved a profitable enterprise. The three utility breeds of rabbits are described.

## DAIRY FARMING—DAIRYING.

**Influence of nutrition of heifers and the age of breeding upon their subsequent development**, C. H. ECKLES and W. W. SWETT (*Missouri Sta. Bul. 163 (1919), pp. 34–36*).—Studies on the protein requirements for growth (E. S. R., 38, p. 682) have been continued with 10 heifers. It is noted that a Holstein heifer receiving 15 per cent of the total energy required for both maintenance (Armsby's determinations) and growth (average results at the station) in the form of protein made about normal growth, but that a Jersey heifer fell below the normal. On a 25 per cent plane a Holstein heifer made more than normal growth and 2 Jerseys were approximately normal.

"The data so far indicate that a 20 per cent plane of protein, or about 75 per cent of that prescribed by the Wolff-Lehmann standard, is ample for normal growth in heifers."

**Modern methods of feeding the dairy cow**, J. M. TRUEMAN (*Rpt. Proc. Conn. Dairymen's Assoc., 36 (1917), pp. 40–51*).—The methods of feeding milch cows at the Nova Scotia Agricultural College, Truro, N. S., are outlined. It is explained that oats, peas, and vetches are grown together and used as a silage crop in the parts of Nova Scotia where corn can not be raised. This silage is included in a number of the rations fed to the college herd.

**New Zealand dairy cows.—Improvement in average production**, W. M. SINGLETON (*Jour. Agr. [New Zeal.], 16 (1918), No. 3, pp. 132–135*).—It is estimated that the average cow in New Zealand gave 142.1 lbs. of butter fat during the season of 1910–11 and 161.8 lbs. in 1916–17. During the interval the number of dairy cows had increased 22.5 per cent. The result has been a considerable increase in exports of butter and cheese. The increasing number of cow testing associations is given most of the credit for the improved yield.

**Improving the profits in the dairy business**, H. C. TAYLOR (*Rpt. Proc. Conn. Dairymen's Assoc., 36 (1917), pp. 21–39*).—On account of the variability in the efficiency of different dairy farms, the author holds that the cost of production is not a satisfactory basis for price fixing. The dairyman who is not making a profit is advised either to get out of the business, so that he will not continue to depress prices by keeping up the supply, or else to improve his methods both by building up his herd and by giving attention to marketing problems. A table showing the variations in efficiency, capacity, and productivity of 51 dairy farms in Barron County, Wis., is presented.

Suggestions are given with respect to purchasing stock and disposing of culls. It is noted that points like longevity, regularity of breeding, ease of milking, and low demand for veterinary services are often overlooked in selecting family lines for specialization.

The discussion of marketing problems consists mostly of accounts of the origin and methods of the Sheboygan County (Wis.) Cheese Producers' Federation and the Milwaukee Milk and Cream Shippers' Association. These are both cooperative organizations of producers. It is stated that the former, consisting of about 45 local associations, successfully fought the monopolistic tendency of the dairy board at Plymouth, Wis., and that the latter opposed the Milwaukee health authorities in their refusal to accept pasteurized milk in lieu of milk from tuberculin-tested herds.

Factors that influence the profits in dairy farming, W. J. Fraser (*Rpt. Proc. Conn. Dairymen's Assoc., 36 (1917), pp. 146–152*).—In the course of this general discussion, brief mention is made of some results of a survey of the cost of milk production on 317 farms in northern Illinois. The close correlation between the average milk production of the cows of the herd and the labor income is pointed out.

How to find the price of protein in milk, W. M. Esten (*Rpt. Proc. Conn. Dairymen's Assoc., 36 (1917), pp. 7–14*.—Assuming that 5 lbs. of milk sugar and 3.4 lbs. of protein are contained in 100 lbs. of milk, irrespective of fat content, the author presents tables showing that with sugar at 9 cts. and butter fat at 45 cts. a pound, the dairyman generally sells his milk proteins at a lower price than he pays for protein in feeding stuffs and below the market rate for meat proteins. This is especially true for milk of high fat percentage even with a sliding scale of prices based on fat content. The cost of proteins in feeds was computed by assuming that the relative cost of a pound of protein and a pound of carbohydrates or fats is in the ratio of 9 : 1.

How dairying built up a community, J. C. McDowell (*U. S. Dept. Agr. Yearbook 1918, pp. 153–168, pls. 4*).—This is an account of the incidental results to the community of the opening at Grove City, Pa., in May, 1915, of an experimental cooperative creamery established by the Dairy Division of the Bureau of Animal Industry, for the purpose of conducting research work on a commercial scale. It is claimed that a spirit of cooperation has been developed between the business men of the city and the farmers. Farmers have been admitted to the Commercial Club, and the banks finance the purchase of purebred cattle. Active interest has been taken in the local cow-test association, the number of accredited (tuberculosis-free) herds has greatly increased, and a rivalry in the production of clean milk has been brought about. Many silos have been built and barns repaired. A Jersey and a Holstein cooperative bull association, a Guernsey breeders' association, a boys' and girls' purebred cattle club, and an accredited dairy cattle show and sales association have all been organized since the establishment of the creamery.

Factors influencing the composition of milk, C. H. Eckles, L. S. Palmer, and W. W. Swett (*Missouri Sta. Bul. 163 (1919), pp. 33, 34*).—The only phase of this project continued during 1917–18 was the "influence of condition at parturition on composition of milk and butter fat." The same cow was used as in the two preceding years (E. S. R., 38, p. 682). When she calved in August, 1917, she was 250 lbs. heavier than in previous years and her milk immediately following parturition was of normal composition. During the two months on a minimum protein plane, the protein and fat percentages were higher than those previously observed. The responses to changes in protein intake resembled those of 1916–17.

Contributions to the physiology of phosphorus and calcium metabolism as related to milk secretion. E. B. MEIGS, N. R. BLATHERWICK, and C. A. CARY (*Jour. Biol. Chem.*, 37 (1919), *No. 1, pp. 1–75, figs. 4*).—This paper, a contribution from the Dairy Division of the U. S. Department of Agriculture, presents and discusses the protocols of experiments with 15 dairy cows and heifers in which the phosphorus, and in some cases the calcium, content of the blood was observed either at intervals during the normal processes of growth, pregnancy, and lactation, or for shorter periods under test conditions.

Three cows in milk and 2 dry were used in a study of the blood plasma precursors of milk phosphorus and milk fat. The experimental procedure consisted of obtaining approximately simultaneous samples of blood from (1) the jugular vein, and (2) the subcutaneous abdominal (anterior "milk") vein of each animal and analyzing the blood and plasma from such samples for total phosphorus, phosphatids, and inorganic phosphorus. Sample 1 was taken to represent blood which had not passed through the mammary gland and sample 2 blood which had. Where the mammary gland was active and the experiment proceeded without undue disturbance to the animal, less phosphatid was found in the abdominal than in the jugular plasmas. No essential differences were observed between lactating and nonlactating individuals with respect to inorganic phosphorus of the plasma; in both, the milk vein contained more than the jugular vein. No evidence was found of the occurrence in the plasma of any class of phosphorus compounds other than phosphatids and inorganic phosphorus. The deductions drawn are as follows:

"The fat and phosphorus which are excreted with milk come from some phosphatid body or bodies in the blood. This material is converted in the mammary gland cells to inorganic phosphate and neutral fat; it yields 2.5 or more parts of phosphorus to 45 of fat; and, as milk contains only about one part of phosphorus to 45 of fat, some 60 per cent of the phosphorus which enters the gland cells with the phosphatid precursor of milk fat must be returned to the blood as inorganic phosphate. . . . The taking up of phosphatid by a cow's gland is stopped if she is subjected to an even slight psychological disturbance." The rate at which the taking up of phosphatid occurs is held to be sufficient to account for the daily production of milk fat. The back flow of inorganic phosphorus, it is claimed, would be difficult to explain if the milk fat is derived even in part from fats in the blood.

Data on the relation of age to the blood phosphorus were obtained from 5 animals. For the first few days after birth the corpuscle phosphorus was about twice as high as in older animals, but the condition rapidly disappeared and was hardly noticeable at four months. The plasma phosphatid of newborn calves was very low and increased gradually during the first year. The inorganic phosphorus in the plasma was fairly high at birth but did not reach a maximum until six months; it then fell off again.

The effect of decrease in the weight of feed given on the blood phosphorous was studied with 2 cows at the height of lactation. The total phosphorus in both blood and plasma, the phosphatid and inorganic phosphorus in the plasma, the total phosphorus in the corpuscles, and the relative volume of the corpuscles fell off during the period of low feeding and recovered when heavier feeding was resumed. The inorganic compounds were more responsive to ration changes than the phosphatids. During low feeding there was a more or less clearly marked inverse relation between the concentration of phosphatid in the plasma and the daily milk yield. "We are inclined to explain this by supposing that the phosphatid was poured into the plasma at a nearly constant rate during this period, and that its concentration in the plasma therefore varied inversely with the rate at which it was excreted in the milk."

Experiments with heifers indicated that feeding disodium phosphate tends to raise the concentration of plasma phosphate, and that feeding with calcium chlorid tends to reduce it. The latter fact is explained by the known influence of calcium feeding on phosphorus excretion.

Evidence was found that the phosphorus content of blood and plasma is likely to be reduced toward the end of pregnancy, even when the phosphorus containing portions of the feed were increased. It is pointed out that pregnant cows could perhaps utilize more phosphorus than they get under ordinary feeding methods.

The most noteworthy accompaniment of lactation observed was a marked tendency for the phosphatid of the plasma to increase during the first month and to remain relatively high throughout lactation. This phenomenon was largely independent of the feed, and is thought to be connected with the tendency for body fat to be thrown out into the blood at the beginning of lactation.

The concentration of calcium in the blood was found to be very constant. Small increases were induced by feeding calcium chlorid. The main factor influencing the calcium content is held to be the mechanism controlling acidosis.

A very full discussion of the analytical methods adopted is given, and the literature on the phosphorus compounds of blood plasma is reviewed.

**Gestation v. stage of lactation as factors causing abnormal composition of cow's milk**, L. S. Palmer and C. H. Eckles (*Amer. Jour. Diseases Children, 13 (1917), No. 5, pp. 413–419*).—Data previously noted (E. S. R., 39, p. 280) on the chemical composition of cows' milk and the physical constants of the butter fat toward the end of lactation are tabulated with some additions, mainly further data for 5 of the cows as to conditions during a 7-day period ending 45 days before parturition. The figures are examined for abnormalities, particularly in fat percentage, protein percentage, and Reichert-Meissl number, so as to determine the justification for the legal exclusion from the market of milk furnished by cows due to calve in less than 45 days.

"The data here presented indicate clearly that cow's milk becomes abnormal in composition as soon as the lactation stimulus becomes an artificial one on the part of the dairyman, and that this result bears no relation to the stage of the gestation period. Many cows show these abnormalities several months before the next parturition, while very heavy producing cows with periods of parturition the usual interval of 12 to 13 months apart may continue to produce perfectly normal milk up to the very hour of the next parturition. The latter are the exception, however, rather than the rule. The great majority of dairy cows in this country are relatively small producers. In these cases the high protein and fat content and abnormal composition of the milk fat characteristic of the end of the lactation period may become important questions in connection with infant feeding long before the 45-day limit is reached."

**Some observations on the efficiency of the present standard agar for the estimation of bacteria in milk**, H. J. Sears and L. L. Case (*Jour. Bact., 3 (1918), No. 6, pp. 531–536*).—Tests are reported to show that agar prepared according to the provisional recommendations of the laboratory section of the American Public Health Association[1] does not, of itself, provide enough nutrients for the growth of many bacteria of the lactic acid type. The small quantity of milk added to the medium in plating 1 cc. of a 1:100 dilution was found to supply the deficiency, but this was not true of higher dilutions. When, however, the higher dilutions were made in sterile 1:100 milk instead of in sterile water, the counts obtained were in general sufficiently consistent with the results of 1:100 dilutions.

[1] Standard Methods of Bacteriological Analysis of Milk, M. P. Ravenel, et al. (Amer. Jour. Pub. Health, 6 (1916), No. 12, pp. 1315–1325).

**The chemistry of churning**, L. S. PALMER (*Missouri Sta. Bul. 163 (1919), pp. 40, 41*).—The microscopic examination of butter made from cream stained with Sudan III and fuchsin is held to confirm the theory of Fischer that butter-making consists of the transformation of a fat-in-colloid-hydrate emulsion (cream) into a colloid-hydrate-in-fat emulsion (butter). The physical chemistry of difficult churning is being investigated.

**Cheese making under Missouri conditions**, L. W. MORLEY (*Missouri Sta. Bul. 163 (1919), pp. 39, 40*).—In connection with a study of cheese-ripening methods, a trial has been made with a method of curing cheeses in an atmosphere of carbon dioxid. It is thought that this plan, which effectively prevents the growth of mold, may solve the problem of curing cheese satisfactorily in pound packages.

**The rediscovery of an old dish**, H. P. DAVIS (*U. S. Dept. Agr. Yearbook 1918, pp. 269–276, pl. 1*).—The author describes the recent nation-wide cottage cheese campaign inaugurated by the Department for the better utilization of skim milk for human food. As an indication of the success of the campaign it is stated that in one city the quantity of cottage cheese sold daily jumped from 10 to nearly 3,000 lbs., and in another from 350 lbs. to more than a ton, and that a creamery which formerly poured 10,000 lbs. of skim milk down the sewer daily later turned it into 700 lbs. of cottage cheese. It is pointed out in conclusion that the extent to which cottage cheese will be used in the future depends largely on its quality, and that the same attention should be paid to its production and refrigeration as to that of other dairy products.

**The use of surplus milk in a small dairy: Cheese making**, R. G. ALLAN (*Agr. Jour. India, 13 (1918), No. 4, pp. 628–638*).—Successful methods of making both soft and hard cheeses on a small scale from buffalo milk are reported as the result of tests at the Agricultural College Experimental Dairy, Nagpur.

## VETERINARY MEDICINE.

**Some results of Federal quarantine against foreign live stock diseases**, G. W. POPE (*U. S. Dept. Agr. Yearbook 1918, pp. 239–246, pls. 2*).—A popular summary of information on the results obtained through Federal quarantine.

**Report of the State veterinarian**, M. JACOB (*Bien. Rpt. Tenn. Dept. Agr., 1917–18, pp. 14–44*).—Included in this report is a discussion of disease investigations, particularly control work with hog cholera.

**Annual report of the Bengal Veterinary College and of the civil veterinary department, Bengal, for the year 1917–18**, A. SMITH (*Ann. Rpt. Bengal Vet. Col. and Civ. Vet. Dept., 1917–18, pp. [30]*).—This is the usual annual report (E. S. R., 39, p. 582).

**Report of the government veterinary surgeon for 1918**, G. W. STURGESS (*Ceylon Admin. Rpts. 1918, Sect. IV, pp. F1–F6*).—The usual annual report (E. S. R., 39, p. 787).

**Colloids in biology and medicine**, H. BECHHOLD, trans. by J. G. M. BULLOWA (*New York: D. Van Nostrand Co., 1919, pp. XIV+464, pl. 1, figs. 70*).—This is a translation of the second edition of this volume, the first edition of which has been previously noted (E. S. R., 27, p. 881).

**A further note on the preparation of culture media suitable for the growth of organisms used in vaccines**, D. NORRIS (*Indian Jour. Med. Research, 6 (1919), No. 4, pp. 569–584*).—This paper, in continuation of the investigation previously noted (E. S. R., 40, p. 667), reports the results of a study of the essential conditions for optimum growth of *Bacillus typhosus* on trypsinized media.

A 10 per cent concentration of the substrate proved to be the best for hydrolysis. At this concentration the substances required by the organism appeared to be formed during the early stages of hydrolysis. With crushed soy beans as a substrate, it was found possible to prolong the hydrolysis beyond its optimum nutritive value, showing further that prolonged hydrolysis is unnecessary.

The action of varying concentrations of enzym on the course of hydrolysis showed that an optimum amount is soon reached, after which further increase appears to have little effect. The temperature of sterilization appeared to influence the nutritive value of the medium, a high temperature being more detrimental than a low one. The temperature at which hydrolysis was effected did not, within limits, influence greatly the nutritive power of the medium. All hydrolyses which gave a small yield of amino acids gave poor growths of bacteria, but a large yield of amino acids did not necessarily indicate a nutritive medium.

A comparison of various media showed that good results could be obtained using a purely vegetable basis, although none of these equalled the results obtained with fresh pancreatic extract and casein. The hydrolysis products of maize did not furnish an efficient medium, which is considered of interest inasmuch as zein on hydrolysis does not yield glycocoll, tryptophan, or lysin.

Peptic digestion did not yield the substances necessary for the growth of *B. typhosus* under the conditions tried, which furnishes a further proof that amino acids are necessary for bacterial growth.

**The suppression of anaphylactic shock**, W. Kopaczevski and A. Vahram (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 5, pp. 250–252*).—The authors have been able to suppress anaphylactic shock in guinea pigs by the intravenous injection of small doses of sodium oleate, saponin, and sodium taurocholate and glycocholate. The action is thought to be due to a lowering of the surface tension of the blood, and the possibility is suggested of utilizing similar substances to prevent anaphylactic accidents in man.

**Experiments on the bactericidal action of sunlight**, M. de Laroquette (*Ann. Inst. Pasteur, 32 (1918), No. 4, pp. 170–192, figs. 3*).—Experiments to determine the bactericidal action of solar rays of various wave-lengths and of white light upon different organisms in solid and liquid media are reported.

The general conclusion is that, from a practical point of view, in hygiene and therapy the direct bactericidal action of sunlight is of only limited value, particularly in temperate regions. In heliotherapy the bactericidal action of light is important only in the treatment of superficial wounds, burns, and skin affections. The indirect action of luminous rays upon living tissues, as evidenced by increased circulatory activity and functional activity of the organs, is considered to be due to a reinforcement of natural means of defense.

**A study of many strains of streptococci with special reference to the streptococci isolated from bovine mastitis**, L. R. Jones (*Michigan Sta. Rpt. 1918, pp. 238–252*).—A report of investigations by the author, presented in large part in tabular form, which is summarized as follows:

"From the diseased udders of cows, hemolyzing and nonhemolyzing streptococci have been isolated. These organisms through their fermentative activities are to be classified as *pyogenes* and *mitis*. None are to be considered as belonging to the *anginosus* group, which is considered as the etiologic factor of sore throat. Future research is necessary to demonstrate the correlation between exaltation in virulence, as by animal passage, and that of fermentative properties together with hemolytic determinations."

**The relation of forage poisoning to botulism** (*Jour. Amer. Med. Assoc., 73 (1919), No. 8, pp. 611, 612*).—An editorial review of the more recent work on

the subject, in which references are made to papers previously noted, namely, by Dickson (E. S. R., 40, p. 176), Buckley and Shippen (E. S. R., 37, p. 179), Graham, Brueckner, and Pontius (E. S. R., 38, pp. 383, 384), Graham and Brueckner (E. S. R., 41, p. 280), Curfam,[1] and McCaskey.[2]

**Need of government action to check botulism,** G. W. McCaskey (*Jour. Amer. Med. Assoc., 73 (1919), No. 11, p. 854*).—In referring to the article noted above, the author records his personal observation of the striking recovery of a patient through the use of serum furnished by Graham.

"The neutralization of the botulinus toxin by fats can not be too strongly emphasized, and clearly demands the prompt and energetic use of castor oil or some other laxative fat, for the double purpose of clearing out the ingested toxins, which are largely performed under saprophytic conditions, and of lowering or destroying the virulence of the toxins by combination with fats. This must be done quickly as intestinal paralysis rapidly supervenes, after which laxatives are, of course, entirely inert."

**Recrudescence of rinderpest in Egypt,** Piot Bey (*Ann. Inst. Pasteur, 33 (1919), No. 3, pp. 197–207*).—The author discusses the reappearance of rinderpest in Egypt during 1916–17, and the measures taken for its eradication. The conclusions drawn from observations made during this time are as follows:

On the appearance of a focus of rinderpest, vaccination by the simultaneous method of all subjects exposed to the contagion is the most effective means of arresting suddenly the extension of the disease and conferring absolute immunity. In the absence of serum, individual isolation of animals will give momentary security. The use for vaccination of virulent blood containing the hematozoa of bovine malaria is, in Egypt, absolutely without danger to both calves and adult animals.

In Egypt the susceptibility to rinderpest is almost absolute in calves but diminishes as the animal grows older, varying in adults in the neighborhood of 50 per cent. Acquired immunity in both parents is apparently transmissible to the offspring, but immunity in one parent alone appears to be without effect on the offspring. The immunity resulting from vaccination persists experimentally for at least three years, and practically for more than five years.

**Antirinderpest vaccination in calves born of an actively immune mother.—Experiments in serovaccination for rinderpest (method of Kolle and Turner) in suckling calves and after weaning,** P. Groveri (*Bul. Soc. Path. Exot., 12 (1919), No. 2, pp. 65–71*).—Attempts at antirinderpest immunization of calves during the time of suckling and after weaning are reported, which indicate that the milk of an actively immune mother confers a passive immunity on the calf which continues during the period of suckling and for some time after, although no longer than three months. Between the periods in which the calf is immune and in which it reacts to vaccination in the normal manner there exists a period in which the calf is somewhat receptive, but the presence of a few antibodies in the circulation renders the reaction feeble and limited to slight elevation of temperature or a slight lachrymation.

**Experimental study of the therapy of tuberculosis,** G. Volpino (*Ann. Inst. Pasteur, 33 (1919), No. 3, pp. 191–196*).—This is the report of a series of experiments conducted by the author, with the collaboration of Colombino, Fornaroli, and Milesi, to determine the effect of xylene and other aromatic hydrocarbons in tuberculosis therapy. It was found that if periodic xylene injections were begun in guinea pigs not too seriously infected on the eighth or tenth day after

[1] Colo. Med. Jour., 14 (1917), No. 2, pp. 35–41.
[2] Amer. Jour. Med. Sci., 158 (1919), No. 1, pp. 57–67, fig. 2.

infection the animals could be kept alive for 40 days without the manifestation of more than limited signs of infection, while in control animals widespread external and internal lesions developed by the fifteenth or eighteenth day after infection.

In a repetition of the experiments with homologues of xylene, cumene was found to be more effective and toluene and mesitylene less effective than xylene. Several essential oils were likewise found to be effective, although some were useless on account of their irritating effect on injection. The author attributes the therapeutic effect of these substances not so much to their chemical composition as to their physical properties, the mechanism consisting largely of a stimulating effect on phagocytosis, which results in a progressive reduction in the number of bacilli followed by a decrease in the tubercular lesions.

The treatment has also been applied with encouraging results in the human subject in cases of localized tuberculosis of joints, glands, and bones. Daily intramuscular injections of a 10 per cent solution of xylene or cumene in sterilized olive oil were easily tolerated and brought about a rapid improvement in the tubercular lesions.

The accredited herd plan in tuberculosis eradication, J. A. Kiernan (*U. S. Dept. Agr. Yearbook 1918, pp. 215–220, pls. 2*).—This is a brief account of the manner in which tuberculosis is being eradicated through the accredited herd plan.

Contagious abortion investigations, J. W. Connaway, A. J. Durant, and H. G. Newman (*Missouri Sta. Bul. 163 (1919), pp. 72–76*).—Sixty-three herds, comprising 856 animals, were given the complement fixation test during the year, which with retests made a total of 1,981 tests in 29 counties. Of the 63 suspected herds investigated, samples from 45 gave a positive reaction.

Bacterium abortus infection of bulls, J. M. Buck, G. T. Creech, and H. H. Ladson (*Jour. Agr. Research [U. S.], 17 (1919), No. 5, pp. 239–246, pls. 3*).—This is a preliminary report from the Bureau of Animal Industry, U. S. Department of Agriculture, of an investigation to determine the frequency with which abortus infection can be demonstrated in the generative organs of bulls giving positive or suspicious reactions to the agglutination test for this disease, and to determine whether or not pathological changes are commonly associated with such infection.

The procedure employed consisted in securing blood samples from the animals upon their arrival at one of the abattoirs for slaughter, and applying the agglutination test to the samples. At the time of slaughter, those animals giving positive or suspicious reactions were autopsied and the organs of the genital system tested culturally for the presence of *B. abortus* infection.

The agglutination test for abortion disease was applied to 325 mature bulls with negative results in 288 cases. Of the 37 bulls whose blood serum showed the presence of *B. abortus* agglutinations, the presence of *B. abortus* infection was demonstrated in four, with marked lesions in two. The findings in these cases are described in detail and illustrated by photographs and photomicrographs of the diseased organs. A description is also given of the examination and findings of a fifth bull, together with a history of the development of the pathological changes associated with the infection.

As a result of the study reported the following conclusions are drawn:

"*B. abortus* infection may involve organs of the generative apparatus of bulls, producing chronic inflammatory changes. Of the generative organs, the seminal vesicles appear to furnish the most favorable site for the lodgment and propagation of abortion infection. The presence of *B. abortus* infection

in bulls appears to be more strongly indicated by relatively marked than by slight reactions to the agglutination test for this disease."

Stomach worm disease in cattle and sheep, W. H. DALRYMPLE (*La. Agr. Col., Ext. Div. Circ. 31 (1919), pp. 8, figs. 6*).—A brief summary of information.

Less cholera, more hogs, O. B. HESS (*U. S. Dept. Agr. Yearbook 1918, pp. 191–194, pls. 2*).—A popular discussion, in which attention is called to the manner in which hog cholera is now being combated and the results obtained.

Effects of heat on trichinæ, B. H. RANSOM and B. SCHWARTZ (*Jour. Agr. Research [U. S.], 17 (1919), No. 5, pp. 201–221*).—This is a report of work commenced and carried on in 1913, 1914, and 1915 by the senior author and taken up since the latter part of 1915 by the junior author, both of the Bureau of Animal Industry of the U. S. Department of Agriculture.

The authors find that the vitality of the larvæ of *Trichinella spiralis* is quickly destroyed by exposure of the parasites to 55° C. (131° F.), gradually attained, the result apparently of irreversible coagulation changes in the protoplasm.

"Trichina larvæ exposed to temperatures slightly below 55° for short periods of time may recover from this exposure; but they die if exposed for longer periods, recovery or death depending apparently upon whether or not beginning coagulation of the protoplasm has proceeded beyond a stage from which a return to normal may occur. Exposed to temperatures in the neighborhood of 50°, trichina larvæ die if the application of heat is sufficiently long continued, apparently as a result of exhaustion following excessive activity to which they are stimulated by the heat.

"The longevity of trichina larvæ freed from their cysts by artificial digestion and kept at temperatures ranging between limits at which they became quiescent from the effects of heat and cold, respectively, varies inversely with the temperature.

"Methods of destroying trichinæ by heating at temperatures below the thermal death point, which may be utilized in connection with the preparation of certain kinds of cured pork products, appear not to be applicable in the case of fresh pork.

"Upon the basis of the results of experiments recorded in this paper, the Bureau of Animal Industry has selected a temperature of 137° F. (58.33° C.) as the minimum temperature to which pork and products containing pork are required to be heated when cooked in establishments operating under Federal meat inspection. This temperature is several degrees above the thermal death point of trichina larvæ, thus providing a certain margin of safety."

The literature is reviewed and a list of 14 references is appended.

The cause of abortion in mares, C. MURRAY (*Jour. Infect. Diseases, 25 (1919), No. 4, pp. 341–348*).—"From an outbreak of abortion in Iowa there was isolated an organism of the paratyphoid-enteritidis group, which in cultural and morphologic characters and in serologic reactions is apparently the same as the organism studied by Good, Meyer, and others [E. S. R., 27, p. 580; 30, p. 586], and variously named by them *B. abortivo-equinus*, *B. abortus equi*, etc. The dry, brittle, membranous growth on slanted agar which was observed by these investigators was present in the cultures isolated in this outbreak, and this peculiarity is of great value in identification of the organism. With this organism abortion was produced in the rabbit, guinea pig, sow, and mare by intraperitoneal or intravenous injection of minute doses in 2, 6, 2, and 11 days, respectively. Feeding and intravaginal introduction of the organism did not result in abortion in any animals thus treated.

"The organism is agglutinated by immune serum for the organisms of paratyphoid-enteritidis group in fairly high dilutions. Serum of rabbits immune to this organism also agglutinate *B. suipestifer*, *B. enteritidis*, and *B. paratyphosus* A and B in dilutions high enough to indicate a close serologic relationship to these organisms."

Strongylidæ in horses, W. YORKE and J. W. S. MACFIE (*Ann. Trop. Med. and Parasitol., 13 (1919), Nos. 1, pp. 57–62*).—In continuation of previous papers (E. S. R., 41, p. 87), the authors describe a seventh new species to which the name *Cylicostomum pateratum* is given.

Strongylidæ in horses.—Species found in American horses, W. YORKE and J. W. S. MACFIE (*Ann. Trop. Med. and Parasitol., 13 (1919), No. 2, pp. 137–143, pls. 3*).—In continuation of the paper above noted, the authors list the species of Strongylidæ found in 15 horses from the United States examined in England, of which 3 belong to the genus Strongylus, 3 to Triodontophorus, 2 to Gyalocephalus, and 12 to Cylicostomum. This is followed by a complete list of all the Strongylinæ in horses, donkeys, and mules recorded from different parts of the world. The pathological findings and their pathogenicity are briefly considered.

On the transmission of two fowl tapeworms, J. E. ACKERT (*Anat. Rec., 15 (1919), No. 6, p. 341; abs. in Jour. Roy. Micros. Soc., No. 1 (1919), p. 43*).—In investigations at the Kansas Experiment Station, the author has found that the house fly may transmit to chickens two tapeworms, one which appears to be *Davainea tetragona*, the other *D. cesticillus*. Flies were trapped in poultry yards where chickens were known to be infested and were fed to 17 isolated chickens. Two of 4 chickens examined were found to be parasititized by *D. tetragona*. In similar experiments in 1917, *D. cesticillus* was transmitted to chickens (E. S. R., 40, p. 359).

Developmental phases of the protozoon of "blackhead" in turkeys, E. E. TYZZER (*Jour. Med. Research, 40 (1919), No. 1, pp. 30, pls. 2*).—"The parasite *Amœba meleagridis* presents a variety of forms which it would be difficult to identify except for the constant presence of an extranuclear body. From this are derived the division centers and a well developed paradesmose which may stretch from side to side of the dividing cell. Binary nuclear division of a character similar to that described in trichomonads is encountered frequently. No indication of any process of multiplication other than binary division has been found.

"Motility, as observed in the warm chamber, is of the nature of amoeboid motion of a slow rate. A large proportion of the organisms examined show no motion.

"The various forms assumed by the parasite and their relationship to the pathological process indicate distinct phases of development. In the invasive phase, the parasite may ingest solid particles as food, and migrates freely through the tissues. The vegetative phase is characterized by the loss of motility and by the absorption of fluid in the place of ingesting solid material. The cytoplasm in both these phases is distinctly basophilic. The resistant phase is characterized by its small size, acidophilic cytoplasm, and by encystment.

"Multiplication by binary division is most active in the invasive phase, continues in the vegetative phase, and ceases in the resistant phase.

"Contrary to Hadley's claim (E. S. R., 36, p. 781), *A. meleagridis* should not be regarded as a cell parasite. Although it migrates freely through the tissues, it does not occur within cells except after motility is lost, when it is soon phagocyted. Within cells the reaction of the organism is purely defensive; multiplication ceases, it decreases in size, and develops a resistant membrane.

"As Smith has pointed out, this infection furnishes a remarkable example of the production of extensive destruction of the tissues of the host through pressure exerted by a rapidly growing parasite.

"Supplementing the presence of morphological characteristics not seen in any of the amoebæ, the daily feeding of Chaparro amargosa, a drug having definite amoebical properties, has failed to prevent infection in young turkeys when exposed to infected birds.

"While the parasite shows a type of nuclear division similar to that of trichomonads and an extranuclear body resembling a blepharoplast, various other features characteristic of trichomonads have not been demonstrated. No intermediate forms connecting this parasite with the trichomonads associated with it in the caeca have been observed."

A bibliography of 99 titles is included.

## RURAL ENGINEERING.

**The drainage movement in the United States,** S. H. McCrory (*U. S. Dept. Agr. Yearbook 1918, pp. 137–144, pls. 6*).—It is stated that there are approximately 102,800,000 acres of swamp, overflowed, and tidal marsh land in the United States, of which about three-fourths are timbered. The author discusses the general features of drainage on a large scale, and emphasizes the importance of collective action in such matters.

**Rainfall, absorption, and run-off on small rural drainage area,** I. E. Houk (*Engin. News-Rec., 82 (1919), No. 18, pp. 875, 876*).—Observations of rainfall, run-off, and soil absorption on a farm in the Miami (Fla.) Conservancy District are reported. The soil is clay loam containing some sand and gravel, and is underlain by comparatively thick glacial deposits of sand and gravel. About 7 per cent of the surface is wooded, and the natural slope varies from 1 to 20 per cent.

From a 24-hour rainfall of 3.51 in. an average increase in moisture content in the soil of about 5.7 per cent was found. Run-off measurements indicated that no run-off occurred on plats with sod covering. Considerable run-off occurred on cultivated plats, varying from 37 to 44 per cent of the rainfall and depending probably on the extent of cultivation.

Run-off measurements from the total drainage area taken after this storm showed an average maximum rate of run-off of 900 sec. ft., or 346 sec. ft. per square mile, which is equivalent to a run-off rate of about 0.54 in. per hour.

A hydraulic jump of about 2 ft. occurred abruptly at the lower end of a concrete-lined channel where the water entered the earth channel, this rise taking place within a length of 50 ft.

**Progress report on run-off investigations on Third Creek, Iredell County,** H. M. Lynde (*North Carolina Sta. Rpt. 1918, pp. 74–87, figs. 5*).—This report is based upon investigations by the station and the U. S. Department of Agriculture, covering five years and nine months, and conducted on a dredged canal through Third Creek Valley for the purpose of determining the relation existing between rainfall and run-off from drainage districts in the Piedmont section of the Southern States. The water shed area is from 2 to 5 miles long, with an average width of about 4 miles. The surface is rolling from the bottom lands, terminating in narrow, flat uplands. The valley has a fall of 6 to 7 ft. per mile at the lower end and about 15 ft. per mile at the upper end. The bottom-land soils are sandy and silty loams, and the upland soils are clay and sandy loams. The conclusion drawn is that for rainfall, topographic, and other condi-

tions like those in the Third Creek drainage area, drainage improvements should provide for a run-off of 0.75 to 1 in. depth per 24 hours.

**Floods and water-logged land: The Land Drainage Act, 1918** (*Jour. Bd. Agr. [London], 25 (1918), No. 8, pp. 961–968*).—This is a brief summary of the changes made and the facilities afforded by the new Land Drainage Act in England and Wales. This act is intended to facilitate the establishment of drainage boards, to render possible a revision of drainage areas to suit modern conditions, and to assist otherwise in the renewal and extension of arterial drainage, including such matters as determining benefits and benefit assessments.

**Moor drainage,** W. Freckmann (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 36 (1918), No. 23, pp. 379–382*).—Six years' experiments with open ditches, pole bundle drains, lath drains, plain tile drains, tile drains with plastered joints, and tile drains laid on laths in a coarse-grained alluvial sand soil are reported. Oats, beans, barley, beets, and rye were planted on soil with underdrainage, and oats, wheat, beets, and potatoes on soil drained with open ditches.

It was found that pipe drains laid on laths gave the most intensive drainage. Plain pipe drains gave almost as good results, but are not considered as satisfactory for moor soils owing to the fouling of the pipes. The pipe drains with plastered joints, designed to prevent the fouling of the pipes by roots, etc., gave only slightly less effective results than the pipe drains laid on laths. The lath drain gave considerably less favorable results than the pipe drain on laths. The pole bundle drains gave the least effective results. Open ditches about 4 ft. deep and about 80 ft. apart gave approximately the same results as pipe drains laid on laths and spaced about 40 ft. apart.

With reference to crop yields a general improvement on all drained soils was noted. The conditions governing this were, however, too variable to permit judgment of types of drains on this basis.

**Hydraulic efficiency of a drainage ditch for five different channel conditions,** C. E. Ramser (*Engin. News-Rec., 82 (1919), No. 11, pp. 522, 523, figs. 5*).—Experiments to determine the values of $n$ in Kutter's formula, made on five courses of the South Forked Deer River in Tennessee, are reported.

The channels along these courses varied from a newly dredged channel in excellent condition to a very crooked course of the old channel in very bad condition. The lowest values of $n$ were obtained in the new, straight, and uniform channel. The effect of roughness and irregularities is shown in a considerably increased value of $n$. "The values of $n$ for the discharge of 715.1 sec.-ft. are 0.0367, 0.0619, and 0.146 for the dredged, old straight, and old crooked channels, respectively, and the slope of the water surface required for this discharge was over three times as much for the old straight as for the dredged channel. . . . The difference in the relative capacities of the old straight and the old crooked channels is not due entirely to the curves in the latter, since the accumulation of trees, logs, and other drift was greater in the crooked channel. However, the difference in the condition of the two channels may be directly attributed to the presence of the curves, since there is a greater tendency for drift and obstructions to accumulate in a curved than in a straight course of channel."

**Canal seepage losses are affected by temperature,** L. Crandall (*Engin. News-Rec., 82 (1919), No. 7, pp. 323, 324, figs. 2*).—Data from seepage investigations on canals of a western irrigation project comprising some 2,600 acres of wet surface are reported. These show that the seepage losses increase with

warmer water, and that in general the variation in temperature during the irrigation season may cause a variation of 30 per cent in the rate of seepage losses.

**The small irrigation pumping plant**, W. L. POWERS and W. J. GILMORE (*Oregon Sta. Bul. 160 (1919), pp. 16, figs. 4*).—This bulletin gives general information on the planning and construction of a small irrigation pumping plant.

**Testing aggregates in the field**, F. H. JACKSON (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 15, pp. 11–13, figs. 3*).—An outfit of field apparatus for testing aggregates in the field is described and illustrated, which has been developed recently by the Bureau of Public Roads. The field equipment so far developed consists of the following units:

One set interchangeable stone screens, with screen plates having perforations 3, 2½, 2, 1½, 1, ¾, ½, and ¼ in. in diameter; 1 set interchangeable sand sieves, of 10, 20, 30, 40, 50, 80, 100, and 200 mesh; 1 circular spring scale having a capacity of 30 lbs. and sensitive to 0.1 lb.; 1 straight spring balance having a capacity of 200 gm. and sensitive to 1 gm.; 1 demountable cubic foot box; 1 ordinary camera-folding tripod; 1 250-cc. graduate; 1 strip of screen wire about 22 in. in length and 5 in. high; and 2 canvas bags about 18 by 18 in. in size. The total outfit weighs approximately 18 lbs. The apparatus for making screen analyses weighs approximately 10 lbs. and may be packed in a space measuring 17 by 8 by 6 in.

**Ultramicroscopic examination of disperse colloids present in bituminous road materials**, E. C. E. LORD (*Jour. Agr. Research [U. S.], 17 (1919), No. 4, pp. 167–176, pl. 1, fig. 1*).—In this article, a contribution from the Bureau of Public Roads, U. S. Department of Agriculture, the author describes the method and apparatus employed in the ultramicroscopic analysis of bituminous road materials, and reports the results of a number of examinations to determine the various colloidal materials contained in different types of bitumens. These bitumens were separated into two groups, the first containing clay as colloidal material, and the second in which this mineral matter was replaced by carbonates, sulphates, and acetates of copper, iron, zinc, and lead. On examining solutions of the second kind under the ultramicroscope it was found that the copper carbonate salts had been largely reduced to red cuprous oxid accompanied by an enormous colloidal dispersion, while with the remaining salts the reduction was much less complete or entirely lacking and the development of colloids correspondingly less.

"It may be stated, therefore, that the colloidal capacity of the second group of materials taken as a whole was dependent largely upon the degree of chemical reaction between the bitumen and the salts employed, while in the first group this supporting value was related more directly to the physical character of the bitumen. A comparison of the duplicate counts . . . indicated that a maximum variation of less than 10 per cent was attained in samples of the first group, while in the second group, the results were, on the whole, less concordant, owing largely to the greater dispersion of colloidal matter. In conclusion, it may be stated that the accuracy of this method for counting colloidal particles in bituminous solutions depends chiefly upon accuracy in construction and calibration of the cell employed, as well as upon the proper consistency and optical purity of the supporting liquid."

**Efficiency of bituminous surfaces and pavements under motor truck traffic**, P. HUBBARD (*Munic. and County Engin., 56 (1919), No. 3, pp. 98–100*).—This is a general review of experience on the subject, in which it is stated that "maintenance by the Bureau of Public Roads [of the U. S. Department of Agricul-

ture] of experimental bituminous surfaces on the Rockville pike, Maryland, which is a macadam road, have demonstrated that such surfaces constructed with suitable tar and oil products are efficient under reasonably heavy traffic, provided the patrol system of maintenance is followed. If such a system had not been in use during the past year, when from 28 traffic counts an average of 135 motor drays, 816 motor pleasure vehicles, and 61 horse-drawn vehicles per day passed over the road, it would from all indications have been completely destroyed."

**Preliminary report of impact tests of auto trucks on roads**, E. B. SMITH and J. T. PAULS (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 15, pp. 8–10, figs. 3*).—Preliminary data are reported from tests of the impact of a 3-ton U. S. A. class B motor truck with solid rubber tires on roads.

The apparatus used in these experiments consists of a heavy steel cylinder in which is fitted a plunger 4 in. in diameter and 8 in. long. A hole is left in the bottom of the cylinder in order to prevent air cushioning under the plunger. On the top or head of the plunger there is securely fastened a heavy steel plate, on which the impact of the truck wheel is received. This whole apparatus is supported rigidly in a concrete box placed in the road in such a position that the height of the steel plate on top of the plunger may be made just flush with the road surface. The height of the upper surface of the plate can be varied by proper steel disks placed under the plunger. In order that the front wheel may pass over and not touch the steel plate on the plunger, a steel bridge is used which is automatically tripped by the front wheel in passing over it. This releases a catch and allows a weighted lever to pull the bridge clear from the apparatus, thus leaving the steel plate exposed and ready to receive the impact of the rear wheel.

Copper compression cylinders ½ in. in diameter and ½ in. long are used for recording the impact values. These are placed under the plunger of the jack. The impact condition under which the tests were conducted was the simple falling of the truck wheel from one level to another at different speeds of the truck, the height of drop varying from ¼ to 3 in.

The data indicate a general tendency of increased impact with the higher speeds, although the increment of increase is less as the speed increases. Also there is a general increase in impact with increase of height of drop. It was found that the action of the truck springs had a great influence on the impact results. When the wheel left the jump-off point the spring snapped open and produced a greater downward acceleration of the unsprung parts than that due to the action of gravity alone. It was also found that the impact was appreciably affected by the conditions of power on or off. When coasting the impact was less than when the power was being applied to the rear wheels, the difference amounting in some cases to as much as 30 per cent.

Further tests are in progress.

An investigation of the vertical movements of concrete pavements, J. W. LOWELL (*Proc. Amer. Concrete Inst., 14 (1918), pp. 366–373, figs. 4; also in Engin. and Contract., 50 (1918), No. 19, pp. 441–443, figs. 4*).—Observations for 12 months on the vertical movement of 87 slabs of reinforced concrete pavement 7 in. thick at the sides and 10 in. thick at the center are reported. The road was of 2-course construction, the base being 1:2.5:4 pebble concrete and the wearing course 1:1:1.5 concrete. Thirty-eight slabs had a subgrade of tough compact clay; 16 slabs had a sand loam subgrade; 14 had a clay, loam, and fine sand subgrade; and the remaining slabs had a sand subgrade.

"Of 86 slabs, 56 cracked. Thirty-eight which cracked deflected at one or both joints more than $\frac{7}{16}$ in. in the 32-ft. width between outside points, 18 less than $\frac{7}{16}$ in. and of these 8 were between $\frac{3}{8}$ and $\frac{7}{16}$ in., while 4 slabs having as great deflection failed to crack. Six of the 10 remaining slabs which cracked, having maximum deflection of from $\frac{3}{8}$ to $\frac{5}{16}$ in. evidently cracked from abnormal settlement of a portion of the subgrade below the original level, leaving 4 slabs, one of which cracked at $\frac{5}{16}$, one at $\frac{1}{16}$, and two at $\frac{3}{32}$ in., which defy explanation unless the deflection had been greater at some period between readings. Every slab reaching a deflection of more than $\frac{7}{16}$ in. cracked, and there were 38 out of 86, so it is safe to assume that such deflection in 32 ft. of width is sufficient to crack any pavement slab of this width built in accordance with present specification and practice. It is also evident that even greater deflection than $\frac{7}{16}$ in. can be expected when the subgrade is clay or loam undrained. . . .

"Thirteen consecutive slabs . . . on sand subgrade acted quite differently and more uniformly than the others. The average upward movement was $\frac{1}{16}$ in. on the west and $1\frac{1}{16}$ in. on the east side, while the center went $\frac{3}{32}$ in. The greatest rise of any point was $1\frac{5}{32}$ in. The movements were so uniform that greatest deflection was $\frac{1}{8}$ in. Unlike the other slabs there was practically no settlement below the initial reading, the greatest recorded being $\frac{3}{32}$ in."

It is concluded that cracking may be eliminated by slab design or by controlling the moisture content of the subgrade. The latter method is considered more feasible from the standpoint of economy.

**State highway mileages and expenditures in the year 1918**, A. P. ANDERSON (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 15, pp. 3–7*).—Data are reported showing that, on the basis of complete reports from 44 States, cash expenditures on the rural roads and bridges of the United States for the calendar year 1918 amounted to $286,098,193. Adding the approximate value of statute and convict labor will bring the total expenditure up to about $300,000,000.

The most striking single development through the year was the tremendous increase in motor truck traffic. During the year the several State highway departments improved a total of 11,944 miles of road, of which about 7,000 miles consisted of grading preparatory to surfacing. The State departments also supervised the maintenance of 203,556 miles, most of which were main and trunk line highways.

**Public roads** (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 15, pp. 32, figs. 17*).—This number of this periodical contains, in addition to 3 papers noted separately in this issue and miscellaneous notes, the following articles: Road Building in the Southwest, by M. O. Eldridge; June a Record-Breaking Month for Federal-Aid Allotments; Primary Road Maintenance Costs, by E. G. Cotterill; and Test and Research Investigations of the Bureau of Public Roads, by P. Hubbard.

**Rainfall influence on durability of zinc-treated crossties**, C. H. TEESDALE and S. W. ALLEN (*Engin. News-Rec., 82 (1919), No. 5, pp. 234, 235*).—Data from a large number of service records on crossties treated with zinc chlorid are considered to indicate "in a general way that the arid Western States and the Central, Atlantic Coast, and New England States north of the 40-in. rainfall line form a definite area where crossties treated with straight zinc chlorid may be expected to give from 8 to 10 years' service."

**Electric light and power from small streams**, A. M. DANIELS (*U. S. Dept. Agr. Yearbook 1918, pp. 221–238, figs. 3*).—The general features of the subject are discussed with particular reference to the installation of small power plants on farms supplied by small streams.

**Internal-combustion engine lubrication and lubricants**, P. H. CONRADSON (*Amer. Soc. Testing Materials Proc., 18 (1918), pp. 387–392; extract in Power, 48 (1918), No. 3, p. 107*).—It is pointed out that the viscosity test of lubricating oil for internal-combustion engines is of value only when the user is familiar with the characteristics of the different crudes of which the oil is made, and that the flash point test is of no consequence after the oil enters the cylinder. Evaporation losses are usually greatest in oils of low flash points. It is further pointed out that specific gravity in no way indicates whether or not lubricating oil will stand up under service conditions.

**Prevention of and protection from smut dust explosions and fires in grain separators**, G. E. THORNTON (*Wash. State Col. Ext. Dept., Ser. 1, No. 46 (1918), pp. 8, pl. 1, figs. 4*).—This circular gives popular information on methods of prevention of fires and dust explosions in grain separators, based on experiments previously noted (E. S. R., 32, p. 386).

**The Shoup oat sprouter**, G. R. SHOUP (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1919), No. 5, pp. 75–82, figs. 3*).—This article describes the construction and operation of an oats sprouter for the preparation of germinated oats for poultry feed.

The sprouter consists of a series of trays with sliding bottoms arranged one above another. The bottoms may be pulled out, while the fronts, sides, and backs remain stationary. This allows the oats to drop to the empty compartments below, which effects the necessary stirring. The daily sprinkling is performed by pouring the soaked oats, water and all, in at the top, which lifts up and back on hinges. The outside cabinet may be made of any common lumber surfaced on one side with the smooth side in. The sprouter should be 5 ft. high for best results.

**Silo construction**, C. K. SHEDD and W. A. FOSTER (*Iowa Sta. Bul. 189 (1919), pp. 97–148, figs. 44*).—This is a revision of Bulletin 141 (E. S. R., 30, p. 89) incorporating data of additional value obtained since 1913. With reference to the water tank placed on top of a masonry silo, it has been found that treatment of the inner surface of the tank with a coating of asphalt followed by cement plastering apparently prevents leakage.

**Capacities of silos and weights of silage**, C. H. ECKLES, O. E. REED, and J. B. FITCH (*Missouri Sta. Bul. 164 (1919), pp. 3–24, figs. 2*).—This bulletin reports data from investigations at the Kansas and Missouri Experiment Stations in which the weight of silage to the cubic foot was taken, by means of a specially designed apparatus, in 32 silos representing five seasons. The weights were taken as the silos were emptied.

It is concluded that the weight of silage is subject to so much variation and is influenced by so many factors that no table of silage weights and silo capacities can be more than approximately correct. The modification of King's table published by the Nebraska Experiment Station (E. S. R., 37, p. 887) is considered to give reasonably accurate results when used to estimate the weight of silage at the time filling is completed. "None of the tables so far published is adapted to estimating the weight of settled silage."

It was found experimentally that the proportion of grain influenced the weight of silage to the cubic foot, but that the fineness of cutting did not appear to be a factor. Weigings of the contents of three silos containing sweet sorghum silage and three containing Kafir corn silage showed no wide variations in weight as compared to corn silage, and it is recommended that, until more data are available, the same table as designed for use with corn silage be used in estimating the weight of silage from these crops.

A new table is given, based upon the experimental data and designed for use in estimating the weight of settled silage, as follows:

*Estimated weight of settled silage.*

| Depth of silage, feet. | Estimated weight of silage per cubic foot. | Average weight of silage per cubic foot. | Diameter, feet. | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 10. | 12. | 14. | 16. | 18. | 20. |
| | *Lbs.* | *Lbs.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| 1 | 32.0 | 32.0 | 1.26 | 1.81 | 2.46 | 3.22 | 4.07 | 5.03 |
| 2 | 32.7 | 32.4 | 2.54 | 3.66 | 4.98 | 6.51 | 8.23 | 10.17 |
| 3 | 33.4 | 32.7 | 3.85 | 5.54 | 7.55 | 9.86 | 12.46 | 15.40 |
| 4 | 34.1 | 33.1 | 5.19 | 7.48 | 10.19 | 13.31 | 16.81 | 20.79 |
| 5 | 34.8 | 33.4 | 6.55 | 9.45 | 12.85 | 16.78 | 21.21 | 26.22 |
| 6 | 35.4 | 33.7 | 7.94 | 11.44 | 15.56 | 20.32 | 25.68 | 31.75 |
| 7 | 36.0 | 34.1 | 9.37 | 13.50 | 18.37 | 23.99 | 30.31 | 37.48 |
| 8 | 36.6 | 34.4 | 10.80 | 15.56 | 21.19 | 27.66 | 34.95 | 43.21 |
| 9 | 37.4 | 34.7 | 12.26 | 17.66 | 24.04 | 31.39 | 39.66 | 49.03 |
| 10 | 38.0 | 35.0 | 13.74 | 19.79 | 26.95 | 35.18 | 44.45 | 54.95 |
| 11 | 38.4 | 35.3 | 15.25 | 21.95 | 29.89 | 39.02 | 49.31 | 60.96 |
| 12 | 38.8 | 35.6 | 16.77 | 24.15 | 32.89 | 42.93 | 54.25 | 67.07 |
| 13 | 39.2 | 35.9 | 18.32 | 26.38 | 35.93 | 46.90 | 59.27 | 73.27 |
| 14 | 39.6 | 36.2 | 19.90 | 28.65 | 39.02 | 50.93 | 64.36 | 79.57 |
| 15 | 40.0 | 36.4 | 21.44 | 30.88 | 42.04 | 54.87 | 69.34 | 85.72 |
| 16 | 40.2 | 36.7 | 23.05 | 33.21 | 45.21 | 59.01 | 74.57 | 92.19 |
| 17 | 40.4 | 36.9 | 24.63 | 35.47 | 48.30 | 63.04 | 79.67 | 98.49 |
| 18 | 40.6 | 37.1 | 26.22 | 37.76 | 51.42 | 67.11 | 84.81 | 104.84 |
| 19 | 40.8 | 37.3 | 27.83 | 40.07 | 54.56 | 71.22 | 90.00 | 111.27 |
| 20 | 41.0 | 37.5 | 29.45 | 42.41 | 57.75 | 75.38 | 95.25 | 117.75 |
| 21 | 41.2 | 37.6 | 31.00 | 44.65 | 60.79 | 79.35 | 100.28 | 123.97 |
| 22 | 41.4 | 37.8 | 32.65 | 47.02 | 64.03 | 83.58 | 105.61 | 130.56 |
| 23 | 41.6 | 38.0 | 34.32 | 49.41 | 67.29 | 87.84 | 110.50 | 137.22 |
| 24 | 41.8 | 38.1 | 35.90 | 51.70 | 70.40 | 91.90 | 116.13 | 143.56 |
| 25 | 42.0 | 38.3 | 37.60 | 54.15 | 73.72 | 96.23 | 121.60 | 150.33 |
| 26 | 42.2 | 38.4 | 39.20 | 56.46 | 76.87 | 100.34 | 126.80 | 156.75 |
| 27 | 42.4 | 38.6 | 40.92 | 58.94 | 80.24 | 104.74 | 132.36 | 163.63 |
| 28 | 42.6 | 38.7 | 42.55 | 61.28 | 83.43 | 108.90 | 137.62 | 170.13 |
| 29 | 42.8 | 38.9 | 44.30 | 63.79 | 86.86 | 113.37 | 143.27 | 177.11 |
| 30 | 43.0 | 39.0 | 45.94 | 66.08 | 90.09 | 117.59 | 148.59 | 183.69 |

**Estimating silo capacities and silage weights**, C. H. ECKLES (*Missouri Sta. Circ. 89 (1919), pp. 4*).—This circular is based on Bulletin 164 noted above.

**[Warehouse construction and fire protection]**, R. L. NEWTON and J. M. WORKMAN (*U. S. Dept. Agr. Yearbook 1918, pp. 408–416, figs. 4*).—This section of this article deals with the important factors in the design and construction of cotton warehouses, with special reference to protection against fire. Fire fighting equipment is briefly described.

**Housing the worker on the farm**, E. B. MCCORMICK (*U. S. Dept. Agr. Yearbook 1918, pp. 347–356, figs. 8*).—This is a general discussion of the sociological phases of the subject, with plans for four houses and general layout plans for farm buildings, with special reference to the house and laborers' house.

**The ideal servant-saving house** (*London: W. & R. Chambers, 1918, pp. VII+122, figs. 48*).—It is the purpose of this book to show how servants can be largely or entirely dispensed with, chiefly by the installation and use of better heating and cooking appliances and other apparatus operated by electricity or gas, specially designed to reduce the labor of the housewife to the smallest possible dimensions and to free it from all disagreeable features."

**Septic tanks**, J. P. FAIRBANK (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1919), No. 5, pp. 72–74, fig. 1*).—Brief instructions are given for the construction of a sewage disposal system consisting of a siphon discharge septic tank and aeration system, with special reference to conditions in western Washington.

## RURAL ECONOMICS.

**Arable land in the United States**, O. E. Baker and H. M. Strong (*U. S. Dept. Agr. Yearbook 1918, pp. 433–441, pls. 10*).—This article describes in detail the location and extent of the present arable, nonarable, and potentially arable land in the United States. Maps show the approximate percentage of the total land area which was improved farm land April 15, 1910, and the location of the land not in farms on the same date. Factors limiting the crop area in the United States are similarly illustrated. Those natural conditions limiting agricultural development which prevail over the area of potentially arable land are considered, and the lands classified as forest and cut-over lands, swamps, and other wet lands susceptible of drainage, potentially irrigable land, and unimproved lands other than woodlands.

It is estimated that 850,000,000 acres of land are at present in crops and potentially available for the production of crops. Of this area, nearly 480,000,000 acres were "improved" in 1910, 200,000,000 acres were of potentially arable forest and cut-over land, 60,000,000 acres were swamps and other wet lands awaiting drainage, 30,000,000 acres of potentially irrigable land, and 80,000,000 acres of other lands. These undeveloped lands may provide about 3,000,000 farms. It is stated that 1,000,000,000 acres or more of nonarable land consists of about 360,000,000 acres of absolute forest land, 615,000,000 acres of grazing land, and 40,000,000 acres of desert land; also, there are about 40,000,000 acres in cities, rural highways, and railroad rights of way. It is asserted that the forest area will probably never be reduced to 360,000,000 acres, that an appreciable proportion of the land suitable for crops will be kept in pasture, and that due to certain economic factors the area in crops will probably never reach the estimated possible total of 850,000,000 acres; but that when the population of the United States becomes as dense as that of northwestern Europe the improved land will be about half of the humid area of the Nation, or from 600,000,000 to 700,000,000 acres.

**Allotments for all**, G. W. Butcher (*London: George Allen & Unwin., Ltd., 1918, pp. 96, pls. 8*).—This is a popular account of successes with war gardens in and about the city of London, with suggestions for winning security of tenure for allotment holders and a description of the aims of the National Union of Allotment Holders.

**Legal decisions affecting alienation of agricultural and forest lands**, P. Sabatini (*Die Gesetzlichen Bestimmungen über die Veräuszerung Land und Forstwirtschaftlicher Grundstücke. Vienna and Leipzig: Carl Gerolds Son, 1918, pp. 77*).—This is a handbook giving the text of several decrees and decisions of dates August 9, 1915, to March 27, 1918, inclusive. An appendix by E. Reichel is included.

**Some points brought out by successive surveys of the same farms**, H. W. Hawthorne (*Jour. Farm Econ., 1 (1919), No. 1, pp. 24–37*).—This discussion centers around three areas, a hill section of Ohio, a dairy section of Wisconsin, and the corn belt in Indiana, for each of which continued surveys extending over five years or longer have been conducted. The object of this paper is to show the variations as they occur year after year, and the variations for the years prior to the war or prior to 1916, as compared with the variations during the war or in 1916 and 1917.

The labor income variation from year to year in each of these areas is first shown. All the areas show higher labor incomes in 1916 than the earlier years, and the Ohio and Wisconsin areas still higher in 1917, owing to combinations of higher price levels and increased production. The percentage return on the

investment after deducting the farmer's labor from the farm income shows the same tendencies to variation as the labor incomes, but the variations are not so wide. In each area and for each year before the war the percentage return on investment was under 5 per cent, while for each year during the war it was over 5 per cent.

From a study of receipts and expenses during the war, compared with those before the war, it is observed that expenses did not increase as rapidly as receipts, yet, separating the years 1916 and 1917, it is found that the percentage increase in expenses in 1916 was only about one-third as great as the increase in receipts. In 1917 it was about two-thirds as great, and the author predicts that when 1918 data for the Ohio area are tabulated, they will show the percentage increase in expenses equal to or in excess of the increase in receipts.

In the Ohio area, with an increase of 2 per cent in the amount of labor, the crop area was increased 9 per cent and the amount of live stock 15 per cent. In the Wisconsin area, with an increase of 4 per cent in the amount of labor, the crop acreage was maintained and the number of cows was increased 13 per cent. In the Indiana area, with no increase in the amount of labor, the corn acreage was increased 15 per cent and the number of hogs sold increased 5 per cent.

The annual output per man of several farm products is tabulated. Dealing with individual farmers for successive years, the author shows that the variations of yearly labor incomes are somewhat greater than the average of all in any of these areas, even though the incomes of entire groups from year to year may be fairly constant. It is observed that the study of an individual farm for a single year will in many instances lead to erroneous conclusions. In trying to find an indication as to the number of years that it might be well to conduct studies of individual farms, the surveyors determined the rank in labor income of each farmer for 1912, then of each for the average of 1912 and 1913, or a 2-year average, then the 3-year average, and so on to the 6-year average. Allowing for variation of two places each time, it was found that there were 14 farmers who changed their relative standing when comparing 1-year with 2-year average and 12 when comparing the 2-year and the 3-year average, while only 4 changed relative standing more than two places when comparing the 5-year and the 6-year averages. Finally, the author summarizes the advantages of both a single year's studies and continued studies.

Farm management, R. M. GREEN (*Missouri Sta. Bul. 163 (1919), pp. 50, 51*).—Studies were conducted during the year to determine the cost of milk production near St. Louis, St. Joseph, and Kansas City, Mo., also factors in farm-living conditions in one of the richest and one of the counties below average, on owned and on tenant farms, and the system of land rental, rate, value of land, yields, and other related data. The conclusions as briefly stated here are, respectively, that farmers who were selling milk wholesale, in general, failed to receive a price that covered cost of production; that the farmer has been able to finance his plant and provide cash for the education and comfort of his family on his operating profits only in the richest sections; and that records secured on 848 farms show that where the price of land is about equal to the agricultural value of the land, a tenant can secure the use of capital at a much cheaper rate by renting the best farms.

The thrashing ring in the corn belt, J. C. RUNDLES (*U. S. Dept. Agr. Yearbook 1918, pp. 247–268*).—On the basis of 80 replies received to a questionnaire sent to 300 ring members mainly from Ohio, Indiana, Michigan, Illinois, and Iowa, problems such as the size of ring, property owned in partnership, thrash-

ing for nonmembers, capital involved and plan of purchase, arranging for the thrashing help and settling the difference in the labor furnished, and others are discussed, and ring regulations drawn up to embody the main features in cooperative agreements are submitted as a guide.

In the discussion of the question of ring ownership and management of the thrashing outfit as against ring hiring, the author points out that 75 per cent of the replies indicated no objection to the ownership of the rigs. He illustrates the economic and financial possibilities of ring ownership with examples of a large, medium-sized, and three small rings. From these reports it is concluded that a rig under favorable conditions can pay for itself within 5 years, that it will give good service for from 10 to 15 years, that in several cases 20 to 25 per cent dividends have been declared, and that where an outfit can thrash at least 800 acres of grain, the financial return can be much greater than for a smaller outfit.

**Agricultural cooperative enterprises in Canada** (*Mo. Rev., U. S. Bur. Labor Statis., 9 (1919), No. 2, pp. 127–129*).—This is a brief summary taken from a statement, dated Alberta, April 15, 1919, by the United States Consul at Calgary, of the agricultural cooperative organizations in Canada considered in two classes, commercial and educational.

**The report of the Agricultural Organization Society for the year ended March 31, 1917** (*Rpt. Agr. Organ. Soc. [London], 1917, pp. VIII+64, pls. 2*).—The work of the Food Production Department of this organization, its cooperation with the Ministry of Munitions, the work of trading, credit, insurance, and small holdings and allotments societies, the Women's Institutes Movement, and other details are reported on.

**[Handling cotton under the United States Warehouse Act]**, R. L. Newton and J. M. Workman (*U. S. Dept. Agr. Yearbook 1918, pp. 416–432, figs. 4*).—Suggestions to warehousemen for facilitating weighing, classifying, and conditioning cotton, devices for handling, and methods of insuring cotton in warehouses with a short-rate table showing percentage of average premium for 1-year policies earned in varying periods of days are given. The forms available in a system of accounts outlined by the Department (E. S. R. 37, p. 594) are listed, and the details of the issuance of licenses under the terms of the U. S. Warehouse Act, and regulations covering receipts are discussed.

**Report of division of markets and rural organization**, W. R. Camp (*North Carolina Sta. Rpt. 1918, pp. 60–71*).—This report covers investigations of cotton prices and cotton grading, surveys of the supply and methods of marketing hogs, needs of farmers for new marketing and credit facilities, and others; also the organization of marketing and credit unions and other service work of the division in the way of grading cotton, assisting in cooperative marketing, supplying market news, etc.

**Following the produce markets**, G. B. Fiske (*U. S. Dept. Agr. Yearbook 1918, pp. 277–288, figs. 2*).—The advantages to growers and shippers of crop forecasts, market news, and reports of weather conditions are set forth, and the Government services for reporting these matters and inspecting produce on arrival are described. Figures illustrate the extent of the leased wire system of the Bureau of Markets and the location of the 32 branch offices at market centers maintained by the market news service on fruits and vegetables during the 1918–19 shipping season, and the 91 temporary farmers' service offices at shipping points, the latter accompanied by a list giving the State, station, and crops reported.

**Monthly Crop Reporter** (*U. S. Dept. Agr., Mo. Crop Rpt., 5 (1919), No. 8, pp. 73–84, fig. 1*).—Statistics and notes are presented showing the estimated farm

value of important products July 15 and August 1, average prices received by producers, and range of prices of agricultural products at important markets, the United States crop summary for August 1, estimated crop conditions with comparisons, a general review of various crops and combined conditions of crops by States, and the cotton condition for July 25 with comparisons. The number also contains data as to farm prices of horses during the last decade, the causes and extent of cotton damage, riding plows used by cotton growers, the disposition of feed crops on farms, war-time wheat prices, condition and forecast for 1919 for beans, hops, grain sorghums, and broom corn, the area of wheat and rye for 1919 compared with 1918, exports of meats and breadstuffs, and miscellaneous notes.

## AGRICULTURAL EDUCATION.

**The report of the conference at the New York State Veterinary College during the semicentennial celebration of Cornell University, June, 1919** (*Cornell Univ., Off. Pubs., 10 (1919), No. D, pp. 89+IV, figs. 37*).—This publication contains the following papers presented at this conference: Half Century of Veterinary Medicine in Cornell University, by J. Law; Doctor James Law: A Biography, by S. H. Gage; The Establishment and Growth of the New York State Veterinary College, by G. S. Hopkins; The Problems and the Opportunities of the Veterinarian, by W. L. Williams; The Relation of the Veterinary College to the State, by V. A. Moore; The Administration of the College and Its Needs, by F. H. Miller; and Buildings and Equipment, by H. J. Milks.

**Agricultural education and promotion,** F. R. Huneeus (*Santiago de Chile: Min. Indus. y Obras Pub., Dir. Gen. Serv. Agr., 1919, pp. 40–48, pls. 2*).—This is a summarized statement of the present organization of agricultural education and research in Chile.

The first step in agricultural education in Chile was the creation in 1851 of a practical school of agriculture under the auspices of the National Society of Agriculture. This school was discontinued, but in 1870 was reestablished in the Agricultural Normal School of Santiago (Quinta Normal de Agricultura) and still exists. The creation of a ministry of agriculture has been under consideration by the Chilean Congress for some time. In the meantime the Direction General of Agricultural Services has for five years undertaken the promotion of agricultural education and research in Chile.

**Officers' agricultural training scheme: Residential training with selected farmers,** H. E. Dale (*Jour. Bd. Agr. [London], 26 (1919), No. 3, pp. 329–332*).—The text is given of a circular letter addressed by the Board of Agriculture and Fisheries to county agricultural executive committees on May 14, 1919, explaining various points in connection with the administration of the scheme for the residential training of officers with selected farmers during the period of about three months that it has been in effective operation. The points covered include the training for candidates with no capital or insufficient capital to start farming, candidates proposing to go abroad on the completion of their training, candidates training with near relatives, candidates who have started training on their own account with a farmer before any grant was made, etc. A brief statement of general progress is made.

**Employment of the agricultural instruction grant to assist school agriculture** (*Agr. Gaz. Canada, 6 (1919), No. 7, pp. 682–686*).—Particulars are given with reference to the amounts allotted from the Agricultural Instruction Act for school agriculture, and the purposes for which they are employed in the Provinces of Prince Edward Island, Nova Scotia, New Brunswick, Ontario, and Manitoba.

**The agricultural short course in the high school**, C. K. McWilliams (*School Sci. and Math., 19 (1919), No. 7, pp. 614–618*).—The author finds that Minnesota and Wisconsin have taken the lead in the organization of these short courses. Minnesota has for some time made the holding of a short course in agriculture a part of the requirement for high school State aid. In Wisconsin, high schools may establish winter courses beginning between October 30 and November 10. The State provides aid to the extent of two-thirds of the salaries of additional teachers required in not more than 15 high schools and not to exceed $500 a school. The course must be approved by the State superintendent of public instruction. In Oregon a unique form of organization is being tried out this year, in which each year's work in agriculture is divided into four units, and two units of each semester are alternated each year. This enables the boys to attend only in the winter months, and yet to take all of the work offered in agriculture.

The short course which has been in successful operation for six years at the Geneseo, Ill., township high school, is briefly described. There is no sequence of subjects, and the student may enter any year. Since the agriculture is operated under the Snfith-Hughes law the boys of the short course, as well as those in the regular course in agriculture, carry out a project during the summer months. The short course diploma is awarded on completion of the full four years' work.

The author finds books dealing with the specific subjects preferable to a text in general agriculture, and gives a brief list of texts. In his opinion the problem of the length of the course and when to begin it is not one of a nice adjustment to the course of study, but rather the best accommodation to the boy. He also prefers the employment of the regular teaching staff, provided it is not already overburdened, to the employment of a special teacher for this work. The entrance requirements should not be so rigid as for regular high school work.

**School gardens**, S. H. Fremantle (*Agr. Jour. India, 14 (1919), No. 2, pp. 256–264, pl. 1*).—In order to encourage the organization of school gardens as an essential factor in a truly rural education, the author explains the objects of the school garden in India and outlines a plan for laying out a garden which involves cooperation with the local educational, agricultural, and horticultural authorities to bring it into effect. In the author's knowledge there has been no organized effort to provide either teachers of nature study or school gardens as recommended by the Government of India in 1913.

**Applied economic botany**, M. T. Cook (*Philadelphia: J. B. Lippincott Co., 1919, pp. XVIII+261, pl. 1, figs. 151*).—The aims of the author in this book are to give a brief statement of the recognized facts and principles concerning plants and plant growth for secondary schools, a list of simple exercises and suggestions for observations which the pupil can conduct without great difficulty, and which will demonstrate many of the statements made in the book, and a list of questions which are intended to be suggestive to the pupils and to encourage further studies. Suggestions are also given with reference to necessary equipment and method. References to helpful literature and a glossary are appended.

**A demonstration of the coefficient of correlation, for elementary students of plant breeding**, H. F. Roberts (*School Sci. and Math., 19 (1919), No. 7, pp. 619–628, figs. 7*).—This is a discussion of a method of demonstrating the coefficient of correlation for use when biometric work forms a part of the schedule in agricultural classes in plant breeding.

**Textiles and clothing**, E. B. McGowan and C. A. Waite (*New York: The Macmillan Co., 1919, pp. IX+268, pl. 1, figs. 71*).—This text for the high school deals with the source, composition, classification, and general characteristics of textile fabrics; the development of spinning and weaving methods; the structure of fabrics; the origin, classification, distribution, cultivation or production, manufacture, finishing processes, and finished products of cotton, flax, wool, and silk; textile testing; care and repair of clothing; and economics and hygiene of clothing. A bibliography and glossary are included.

**Clothing for the family**, L. I. Baldt (*Fed. Bd. Vocat. Ed. Bul. 23 (1918), pp. 115, pls. 4, figs. 60*).—This course is designed especially to meet the needs of part-time and evening schools and classes for a general course of instruction in the principles of clothing. It is intended primarily to equip the beginner with the fundamental principles of clothing economics, including a knowledge of textiles, an appreciation of design, training in the elementary technical processes of sewing, and a knowledge of the elements of the care and repair of clothing. The five sections of the course deal, respectively, with the making of undergarments, 16 lessons; elementary dressmaking, 17 lessons; advanced dressmaking, 30 lessons; infants' and children's clothing, 17 lessons; and millinery, 19 lessons. Suggestions and outlines for a group of lessons on the conservation of clothing are included. A lesson plan and bibliography are appended.

## MISCELLANEOUS.

**Yearbook of the Department of Agriculture, 1918** (*U. S. Dept. Agr. Yearbook 1918, pp. 760, pls. 62, figs. 50*).—This contains the report of the Secretary of Agriculture; 31 special articles abstracted elsewhere in this issue; an appendix containing a directory of the agricultural colleges and experiment stations, the State officials in charge of agricultural and extension work, and National and International livestock associations; and the usual statistics of the principal crops, farm animals and their products, the Federal meat inspection, imports and exports of agricultural products, crop summaries, States leading in staple crops, crop value comparisons, estimated value of farm products, world production and export trade in important crops, foreign trade in foodstuffs, miscellaneous information relating to various crops and to live stock, production per man and per acre for different countries, movement of farm produce, prices paid by farmers for miscellaneous articles, information pertaining to farm labor, value of plow land by States, depth of plowing by States, index numbers of prices of crops and meat animals, materials used in brewing in the United States, hop movement and consumption, farm prices of turnips, cabbage, onions, turkeys, and chickens, railway freight tonnage for 1915–17, wagon and motor-truck hauls from farms to shipping points, rural and agricultural populations and area of agricultural land by countries, area and utilization of the National Forests, area and carrying capacity of pasture land by States, and bushel weights of commodities for which bushel weights have been established in the United States and in the different States.

**Thirty-first annual report of Michigan Station, 1918** (*Michigan Sta. Rpt. 1918, pp. 231–931, figs. 307*).—This contains a financial statement for the year ended June 30, 1918; reports of the director and heads of departments on the work of the station during the year, the experimental features of which have been for the most part abstracted elsewhere in this issue, but including also bacteriological analyses of well waters and canned fruits and vegetables and brief notes on a stump-clearing test and feeding trials with pigs on velvet beans, velvet bean feed, and garbage; and reprints of Bulletins 279–281, Special

Bulletins 82–89, Circulars 33–35, and Technical Bulletins 34–42, all of which have been previously noted.

**Work and progress of the agricultural experiment station for the year July 1, 1917, to June 30, 1918** (*Missouri Sta. Bul. 163 (1919), pp. 78, figs. 21*).—This contains the organization list, a report by the director on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1918. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

**Forty-first Annual Report of North Carolina Station, 1918** (*North Carolina Sta. Rpt. 1918, pp. [128], pls. 11, figs. 9*).—This contains the organization list, a report of the director and heads of departments, a financial statement for the year ended June 30, 1918, a special article noted on page 686, and reprints of Bulletins 238 and 240 and Technical Bulletin 14, which have already been noted. The experimental work reported is for the most part abstracted elsewhere in this issue.

**Monthly bulletin of the Western Washington Substation** (*Washington Sta., West. Wash. Sta., Mo. Bul., 7 (1919), No. 5, pp. 65–83, figs. 6*).—In addition to articles abstracted elsewhere in this issue, this number contains brief articles on the following subjects: Extension of the Work of the Experiment Station, by W. A. Linklater; Concerning Courses Offered at the State College of Washington, by J. L. Ashlock; Work of the Extension Service, by S. B. Nelson; Founding a Purebred Dairy Herd, by K. B. Musser; Early Fall Spraying for Apple Anthracnose, by A. Frank; and Missing Cylinders are Dangerous, by J. P. Fairbank.

**How to do things** (*Philadelphia: Wilmer Atkinson Co., 1919, pp. 572, figs. 921*).—This is a compendium of a large number of farm and household devices, helps, hints, recipes, formulas, etc., as reprinted from *The Farm Journal*.

# NOTES.

**Colorado College and Station.**—Dr. W. W. Robbins has resigned as professor of botany and botanist to accept a position with the experimental department of a sugar beet company.

**Connecticut State Station.**—R. E. Andrew has been appointed assistant chemist vice C. B. Morison, whose resignation has been previously noted.

**Iowa College and Station.**—Dr. Paul Emerson, associate bacteriologist at the Idaho Station, has accepted an appointment as assistant professor of soils and assistant chief in soil chemistry. H. W. Johnson has been transferred from assistant soil bacteriologist to associate professor of soils and assistant chief in soil chemistry and bacteriologist in humus investigations.

**Kansas College.**—Dr. A. G. Hogan, assistant professor of chemistry and assistant in animal nutrition, has resigned to become professor of biochemistry in the Medical School of the University of Alabama. Dr. J. S. Hughes has been appointed assistant in animal nutrition. A. C. Hartenbower, superintendent of farmers' institutes and extension schools, has resigned to engage in farming.

**Kentucky University and Station.**—Dr. W. R. Pinnell, special bacteriologist in the public service laboratories; Otis Kercher, State leader of boys' club work; F. J. Sutton, assistant professor of horticulture; W. D. Iler, assistant chemist; and A. L. Brueckner, assistant in animal pathology, have resigned. John B. Nelson has been appointed assistant bacteriologist and Miss Marie Jackson, seed analyst.

**Maryland Station.**—E. H. Parfitt has been appointed assistant in dairy research.

**Massachusetts Station.**—Recent appointments include Miss Anne C. Messer as assistant chemist in the research laboratory, Arthur M. Clarke as assistant chemist in the fertilizer laboratory, and Miss Marguerite G. Ickis, curator in the department of botany, vice Mrs. S. W. Wheeler, resigned.

**Minnesota University and Station.**—Increases of tuition, averaging in the College of Agriculture $18 per term, have been decided upon beginning July 1, 1920, to meet the increased expenses due to the unexpectedly large enrollments.

Construction of a new administration building for the university has been authorized. A comprehensive building plan is being prepared.

An experimental wheat flour mill is to be built next spring at Minneapolis by the State railway and warehouse commission and the State department of agriculture, with the advisory assistance of the College of Agriculture. An appropriation of $35,000 was made by the legislature at its recent special session for this purpose. The mill will have a capacity of about 100 bbls. a day. It is expected to be used principally in the study of grain grading and marketing problems and to obtain cost data as to flour making.

**New York State Station.**—Laura G. Collison has been appointed editor and librarian and Millard G. Moore assistant chemist.

**Pennsylvania College and Station.**—J. W. Miller, instructor in plant pathology, has resigned. W. A. Kuntz has been appointed assistant in botany.

**Clemson College.**—L. V. Starkey, extension specialist in animal husbandry at the University of West Virginia, has been appointed professor of animal husbandry.

# EXPERIMENT STATION RECORD.

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The place which the economic and social sciences are to occupy in the program of the agricultural colleges from now on is becoming increasingly clear. Conviction on that point is now rapidly crystallizing, and a stage has been reached where development in these lines is looked upon as one of the most essential features.

While these subjects in their special relations to agriculture are far from being new, until quite recently they have made relatively slow progress in the institutions as a whole, except in a few lines. In a sense, they represent a departure from the trend in which development has occurred, for in their broader ranges they lie in a different field from the class of subjects which have hitherto received main attention. This has made their growth contingent on an enlarged view of the field and function of the agricultural colleges. The Chicago convention bore evidence to the growth of sentiment in this line and the importance which is now being attached to these subjects. The business and social relations of farming were accepted as being quite as much in the field of the colleges as the technical factors of production. The cultivation of this field was recognized as not only desirable but as a prerogative of the agricultural college.

A noticeable feature of the convention was a wider departure from the strictly professional and pedagogic view of certain subjects in the field of these colleges to the idea of more direct service to the State, to the people concerned in its industries and their general welfare as well as their productive efficiency and business prosperity. While this aim has for some time been exemplified in the work of these colleges, it is assuming increasing prominence as a part of the college function.

The matter was emphasized by Dr. Lory in his presidential address, and the acceptance of the views he expressed showed how general this attitude of public service has now become. Undoubtedly it is in a measure a result of the war activities of these colleges, which forced them forward into new prominence and an enlarged field of responsibility and action. Dr. Lory argued for greater attention on the part of these colleges to what has been designated as the human side of agriculture, the business and the social relations as embraced in rural economics and rural sociology, country life and conditions

for a virile rural population. He included both research and extension work in his program, with attention to improvement of the rural schools along with country life advancement, for he maintained that better farming is dependent on better country schools. The development of departments of education in the colleges, with special provision for teacher training in agriculture and home economics, has prepared the way for the exercise of this external interest and influence that should reach out through the country districts, studying the situation and extending cooperation and council.

Others emphasized the field of the social sciences and such subjects of vital interest to the industry as marketing, and urged that the colleges must take the lead in developing the basis for these lines of effort. The range of their purview has extended beyond production, to distribution and marketing; and on the other hand, the conditions under which production is necessarily carried on make the living conditions of the country, the environment of the farmer and his family, a matter of special concern. The enlargement of the opportunities of country life call for a study of conditions as a basis for devising ways and means, and for the development of local leadership, since improvement is recognized as ultimately dependent on the country people themselves.

Similarly, the Secretary of Agriculture in his address to the association laid much emphasis on the human factors in agriculture, the provision of aid in relation to markets, organization for cooperation, the development of leaders, and the breaking down of the barrier of misunderstanding which surrounds the industry. He referred to the fact that many people ignorant of rural problems speak and write as if farming were not a business, and as if production did not involve the expenditure of capital and labor; and he declared that "the farmer as well as the industrial worker is entitled to a living wage and to a reasonable profit on his investment. He is entitled also to satisfactory educational opportunities for his children, and to the benefits of modern medical science and sanitation." He maintained that when these requirements are met there will be no difficulty in retaining in the rural districts a sufficient number of contented and efficient people; and he declared that "what we need is not back to the land propaganda but an acceleration of the work for the improvement of the countryside which will render the abandonment of farms unnecessary and the expansion of farming inevitable." Advocating a broad survey of rural life, its special problems and relationships, the Secretary did not restrict the need of this to the formulation of a comprehensive flexible program, but pointed also to its importance in the education of the American public, "particularly the urban part of it."

In another address the Secretary emphasized the importance of marketing studies in aiding the farming industry, and insisted that the agricultural colleges should recognize the burden upon them for training men for this service.

There is no longer any question, therefore, as to the existence of a rural problem, or doubt as to the great importance of its study. Such uncertainty, and even resentment, as was manifested when the subject was mapped out by the Commission on Country Life less than twelve years ago has given way to a live interest and action. This shows how far we have already come in this direction.

Few things are more interesting than tracing the development of an idea, the working out of a new departure or line of action. The history of agricultural institutions is especially rich in such opportunity. Each new proposal has had to make its way step by step, in the face of more or less opposition or lack of response, before it has been accepted and given support. This doubting attitude has characterized not only farmers but often their leaders and those who speak for them. It is natural that it should be pronounced when it touches the customs, traditions, methods, and even the individuality of a people who have developed on the basis of self-reliance and independence.

We have only to recall how hard was the beginning of the agricultural school and later of the agricultural college. Few institutions ever passed through darker days. Relatively few people believed in them, and still less understood their opportunities for usefulness. There are still those who contend that these colleges were designed and should have continued to be only trade schools. Later when the experiment station was suggested it was received with little enthusiasm and had to justify itself largely by the analysis of commercial fertilizers to protect the farmers from imposition. The station was the first attempt to do something tangible for the farmers themselves, and it proved an entering wedge which was ultimately most effective. But at the outset most farmers thought they knew of their own knowledge and the experience of their forbears how to farm their lands and take care of their herds, and they were living in a time when they could hardly help making a living on the farm. Even after the station became a subject of Government patronage it had its difficulties at home, in working out its functions and devoting means to ends. We can see now that if there had been more vision and courage in the early years progress might have been more rapid in some of the States.

By sheer force of the results of their work the stations gradually compelled recognition, to a constantly broadening extent, and won

confidence in the belief that theory had a place in practice. It is an interesting fact that the coming of this recognition marked a breaking down of the reserve between the college and the farmer in matters that pertained to his methods and practices in production. From it developed in course of time the agricultural extension work, which brought about the more intimate relationships and prepared for an increasing measure of public service.

But the business side of farming, the things which pertain to its relationships and to the conditions of living in the country had hardly been touched. These were more personal and secure against intrusion; and besides, farmers were noted for their shrewd business traits and the country famed for its healthfulness and its superior output of men. There were few who recognized that there was a real country problem susceptible of study and remedy, and fewer still who had the courage to declare publicly that it was a concern of the agricultural college and ought to be brought within its sphere of action. Gradually, however, it came to be urged that mere productiveness does not solve the farm question; that the farmer cares less for the second blade of grass than he does for the proper return from the first blade, and that farmers must prosper, not individually here and there but as a class. It was said that the farmer "must know the laws of economics as well as the laws of soil fertility"; and moreover that it is not enough that the farmers of the country be skilled growers of produce, successful sellers of what they grow, but that the farming class must keep pace with other classes in its general, social, and intellectual powers. It was maintained that they must secure for themselves the highest possible position, not only in industry but in the political and social organization of society.

The doctrine of the broader field of the college was regarded as quite radical when a speaker at a convention of the land-grant colleges over a dozen years ago declared that they "must purpose to stand as sponsor for the whole rural problem," and unfolded a program for economics which involved much more than adding three or four subjects of study to the agricultural course. "It involves," he said, "the very function and policy of the college itself. It alone gives proportion to the problem of agricultural education, because, while distinctly admitting the need of better farming and the consequently fundamental necessity of the technical training of farmers, it emphasizes the importance of the economic and political and social aspects of rural development. And it thereby indicates that only by a due recognition of these factors, in purpose, in organization, and in course of study, can the American agricultural college fulfill its mission to the American farmer."

This broad vision, however, and other forceful references to the matter, brought little response; and when the Commission on Coun-

try Life was appointed in 1908 it was received with surprise and even skepticism, and regarded by some as in the nature of a reproach. Those who remained open-minded toward it were often none the less doubtful as to the meaning of it or the necessity for it.

The commission was a response to a belief that, while farmers at that time were probably more prosperous than at any previous period, country living and the opportunities for a healthful and satisfying life were trailing considerably behind those of urban communities, and that this was having an unmistakable effect upon the welfare of the agricultural people and upon the industry itself. In appointing the commission, the President expressed the view that while public attention had rightly been concentrated at the beginning on means of increasing production, when this had been accomplished "the effort for better farming should cease to stand alone and should be accompanied by the effort for better business and better living on the farm." He held that the great rural interests are human interests, and that good crops are of little value to the farmer unless they open the door to a good kind of life on the farm.

The inquiry and the recommendations of the commission rested in the belief that country life might be made to supply the four great requirements—health, education, occupation, and society; that the disadvantages and handicaps that are not a natural part of the farmer's business should be removed, and that forces should be encouraged and set in motion which would stimulate and direct forcefully local initiative and leadership. Its life was too short to do more than open up the subject and set in motion a train of thought which gradually led to study and action, and has resulted in much progress in improving material conditions. It is interesting to note how many of the suggestions made in its brief report have been put into effect in the less than twelve years that have intervened. These include the establishment of an agricultural extension system on a national basis, a rural credit system, parcel post and postal savings banks, a national system of road improvement, the provision of a vast amount of information on marketing, market conditions, prices, warehouses, etc., the establishment of standards for grading products, promotion of organization and cooperation, the control of liquor traffic, greater attention to rural health, and numerous other measures which have a vital bearing on farming and life in the country.

Progress in the introduction of rural economics in the colleges has been quite steady in the past few years, and as a teaching subject it is now accorded a definite place. Nation-wide activity has been organized in aid of marketing farm products, and farm management has become a well recognized branch. But investigation in the broad

field of rural economics has been quite limited thus far, and has not yet formed a prominent feature of the experiment stations.

The need for investigation, however, and especially for fundamental inquiry has become more urgent with the growth of teaching and the attempts at regulation or improvement of economic methods. These have revealed the fragmentary character of information based on broad investigation, and have suggested topics which need more systematic study. Naturally the first effort has been to build up a substantial background of fact to show what the actual conditions are and thus give a basis for more intensive inquiry. There is a feeling that a point has been reached where the latter type of work should become more extensive, in order to disclose relationships and reasons and thus to develop the principles which are operative.

Specialists maintain that the method of science is quite as applicable to questions in farm economics as to those in other branches, and that the field embraced may furnish subjects just as scientific and suitable to high grade investigation as the physical and biological aspects of agricultural practice. These may be approached in the same spirit and given the same careful treatment in the gathering and analysis of data as subjects bearing on soil fertility or the cause and control of plant disease. The fact that the problems differ in kind and in method of study does not necessarily imply that in one class the work is in any sense inferior in character, less searching, or more rigid in interpretation.

Because the statistical instead of the experimental method is employed seems no reason why economics should be excluded from the experiment station, which as the research branch of the agricultural college is comprehensive in its scope. After all, the character of the work is what determines its grade and entitles it to be ranked as scientific research. Questions relating to the technology of production were first taken up by the experiment stations, and these have usually more than absorbed the funds thus far available. In the provision for expansion effort should undoubtedly be made for this newer branch, in which there will evidently be increasing demand for information.

Doubt as to the importance of a general expansion of economic research is perhaps attributable to the character of much of the work in the past, and the feeling that the number of broad underlying principles which may be developed is relatively limited. The taking of data has sometimes appeared to be an end in itself, supplying interesting information on conditions which are constantly fluctuating rather than permanent, and are not shown to conform to fixed laws. A census or a survey may furnish the basis for research without itself being in that field. It may bear the same relation to original inquiry that deriving results from a series of simple experi-

ments has. In either case the plan and purpose in accordance with which the data are taken, the adequacy of the plan to supply the necessary dependable data to carry out the purpose of the inquiry, and the analysis and interpretation of the data in a manner to disclose true relationships, will determine the grade of a piece of work and the rank it is entitled to. The result may be more exact or final in one case than in another, but the method of science must be evident in all activity classed as research. The difference in grade may be analogous to that between tabulated popular opinion based on experience and the weighed evidence deduced by the scientist. The first may be interesting and helpful, but it needs the skilled interpretation of the investigator to give it the authority of science.

In any new subject dependent on public support it is necessary to do a certain amount of work which will show the possibilities in that field and tend to arouse popular interest in it. In agriculture the gathering of data on existing conditions and practices is helpful as a starting point, and gives something of a background of fact. This has been true in economics. Just as in the early days interest and support were aroused for larger things by analysis of commercial fertilizers and the making of local tests, so in this newer line it has been necessary to arouse interest by opening up the field and by doing things which are to some extent in the nature of personal or advisory service. But as the subject has progressed and become more widely accepted in the curriculum and in framing public measures, the necessity has grown for fundamental data which are general instead of local or individual, and express a broad principle.

The field of investigation in farm economics has been considerably clarified by the recent reorganization and enlargement of the Office and Farm Management. The proposal for extensive cooperation between the Department and the experiment stations in carrying on studies in this field, and the discussion which has been going on regarding the character of investigation to be undertaken will undoubtedly have an important bearing on the development of systematic inquiry. The more definite setting forth of fundamental problems and the working out of plans for specific inquiries can hardly fail to stimulate and intensify investigation. The formation of the American Farm Economic Association and the character of papers presented at its recent meeting in Chicago are evidence of a redirection which is taking place.

The inclusion of the human factors in farm economy along with farm economics and farm management has paved the way for enlarged attention to rural sociology and problems of country life. The meeting of the Annual Country Life Conference at Chicago,

now a large, live, and many sided organization, and its joint sessions with the Farm Economic Association, are further evidences of progress in that field.

This second Annual Country Life Conference was devoted principally to rural health, and developed the agencies which are now engaged in studying rural health conditions and problems, rural public health, nursing, rural social welfare work, and housing, education and recreation in relation to rural health. In his presidential address before this conference, President Butterfield made some practical suggestions for the work of the organization, stressing especially an attempt to correlate the efforts of different groups engaged in country life activities. Interest in various aspects of country life, he reported, is steadily growing. Farmers are more ready to recognize, for example, that there is a rural health problem; and this problem was defined as embracing three phases—public health, rural sanitation, and body building. It was suggested that there should be an effort to put rural health into the program of agricultural extension work.

President Butterfield declared that the farmers are thinking more to-day in terms of economic problems than in those of technical problems. He maintained that the program of agricultural education has been too narrow to meet the needs of farming people. He urged the importance of training for leadership, and of developing local initiative and leadership so that a movement once under way will not die because a leader drops out.

An important paper from the standpoint of investigation in rural sociology was one by Dr. C. J. Galpin, one of the few in this country who has specialized in this field. His paper on The Human Side of Farm Economy dealt with the subject in its relations to the farmer, the investigator, and the public. He explained the importance of the human factor in the success of farming, and quoted Dr. H. C. Taylor to the effect that "whatever affects man as an agent in agricultural production seriously affects the results of this basic industry."

The general absence of specialists in this particular field and the scarcity of trustworthy information and data on which to base generalizations were cited as standing out with startling clarity, in relation to both inquiry and teaching. Rural sociology lacks as a working basis a classified census of the farm population as distinguished from the rural population, and until the farm population is sorted out and classified with respect to its characteristics, attainments and shortcomings, Dr. Galpin explained that progress in a National study will be greatly handicapped.

One of the most suggestive features of the paper was the analysis of the field and the setting forth of certain quite specific lines of

inquiry. This will be helpful to those who have accepted in an academic way the growing importance of this subject, but have only conceived dimly the research aspects of it or the specific lines along which inquiry should proceed. Here, as in rural economics, the securing of a sufficient background of data will be essential to the development of facts of limited range, and the taking of these will naturally constitute a rather elementary type of work. The broader surveys will clear the way for more detailed and intimate studies and at the same time will disclose actual conditions on which remedial or corrective measures must rest.

It is the consensus of opinion that the individual and the circumstances which surround him are vital factors to be taken account of in farm management and farm economic studies, and it is natural therefore that the Office of Farm Management should supply the nucleus for the new line of study relating to the farmer and his environment. For, as Professor Galpin shows, the rural problem, the problem of how to maintain a high standard of rural citizenship, is a much broader one than that of financial prosperity. Fundamentally it is the maintenance of American standards of living on the farm. The conditions of it are as yet unknown because unstudied. The country people often solve it by moving away from the land, thus taking from the country the persons possessing seasoned farm practice and the high qualities which it is especially desired to retain there. The problem, as he states, "is a very complicated social, human, psychological, and political problem, having to do with a class of people whose cultural, esthetic, and intellectual aspirations have hitherto been very largely postponed by one force or another, by one set of circumstances or another." That these things can be analyzed and studied in a way to develop trustworthy relations between cause and effect there can be little doubt.

# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**A study of the oil from sumac (Rhus glabra)**, H. W. BRUBAKER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, p. 950*).—Oil extracted with dry ether from the berries of the common sumac (*R. glabra*) gathered in Kansas was found to have the following average constants: Specific gravity at 15° C. 0.92577, index of refraction at 20° (Abbé's refractometer) 1.471, acid value 0.9, acetyl value 9.235, saponification number 192.6, iodin number 126.76, soluble fatty acids 0.766 per cent, and insoluble fatty acids 93.54 per cent.

The oil, which averaged over 11 per cent of the ground seeds, is said to have a mild odor, pleasant taste, and a deep yellow color, and to be rather viscid at ordinary room temperature. It has fairly good drying qualities and saponifies readily, giving a sodium soap of semisolid consistency. The author is of the opinion that it might readily find a use as an edible oil, or in the soap-making industry, or as a semidrying oil in the paint industry.

**The composition of the fruit of the Virginia creeper (Ampelopsis quinquefolia)**, G. D. BEAL and E. A. GLENZ (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, pp. 959, 960*).—The analyses reported include determinations of the proximate constituents of the fruit of the Virginia creeper (*A. quinquefolia*) by extraction with benzene, methyl alcohol, water, and sulphuric acid, and the analytical constants of the oil as extracted from the seeds by petroleum ether. The seeds yielded on 16-hour extraction in the Soxhlet apparatus 25.6 per cent of an odorless oil of the appearance of olive oil and with a slight taste suggestive of castor oil. The oil belongs in the castor oil group of fatty oils as shown by the following analytical constants: Specific gravity at 15.5° C. 0.924, index of refraction at 15° 1.4762, saponification number from 186 to 194, and iodin number 86 to 90.

**The indigenous tans and vegetable dyestuffs of New Zealand.—II, Experimental**, B. C. ASTON (*Jour. Agr. [New Zeal.], 16 (1918), No. 6, pp. 358–365*).—In continuation of the article previously noted (E. S. R., 38, p. 309), experimental data are reported on the tannin content of New Zealand trees, and directions are given for dyeing woolen goods with the bark or root of *Coprosma grandifolia*, the kanono or tree-karamu of the Maori.

**Manipulations of applied analytical chemistry**, M. FRANCOIS (*Manipulations de Chimie Analytique Appliquée. Paris: Octave Doin & Son, 1919. pp. 268, figs. 18*).—This manual, the material of which corresponds to the laboratory work in chemistry of the fourth year of the Schools of Pharmacy, France, consists of four sections as follows: Analysis of drugs, analysis of food materials, biological analyses, and toxicological analyses.

In the selection and grouping of material a general knowledge of chemistry and analytical chemistry is presupposed, the arrangement of manipulation is such that one passes from the more easy to the more difficult procedures, and one method only is given for the analysis of each substance.

The original text for the section on biological analysis was written by Grimbert.

**Electrometric titrations, with special reference to the determination of ferrous and ferric iron,** J. C. HOSTETTER and H. S. ROBERTS (*Jour. Amer. Chem. Soc., 41 (1919), No. 9, pp. 1337–1357, figs. 15*).—An electrometric titration method with standard dichromate is described, which is said to permit the determination of a few tenths of a milligram of ferrous iron in the presence of any quantity (up to 100 gm.) of ferric iron and which can be applied to other oxidation and reduction reactions. The various factors affecting the determination have been studied in detail, and the technique has been so developed that as sharp end points can be obtained with N/100 or even with N/2000 dichromate solutions as with the more concentrated solutions usually employed.

A new feature of the apparatus employed consists of a titrating head used to cover the flask which contains the solution to be titrated, in order to control the atmosphere above the solution and to support the calomel half-cell and the platinum electrode. Readings are made with the slide wire potentiometer of Roberts, previously noted (E. S. R., 41, p. 503).

Some of the advantages of the electrometric method for oxidizing and reducing reactions are summarized as follows:

"This method permits the use of potassium dichromate with its numerous advantages. The reduction of the solution with electrometric control eliminates the removal of excess reducing agent, which must be done with the usual methods of reduction. Conditions, such as acidity, need not be controlled except within very wide limits, and hydrochloric, sulphuric, or hydrofluoric acid, or mixtures of these, may all be used. . . .

"The sensitivity and accuracy of the method makes possible (a) the determination of a few tenths of a milligram of tin, chromium, ferrous or ferric iron, and probably many other elements, in the presence of large quantities of some other element, and (b) the determination of blanks involved in some of the ordinary determinations by reducing or oxidizing agents.

"The time within which a determination can be carried out is greatly shortened. The content of ferrous and ferric iron in a silicate, for instance, can be determined in from 15 to 30 minutes. The precision attainable is comparable to the best of the ordinary volumetric determinations."

**The hydrochloric acid color method for determining iron,** J. C. HOSTETTER (*Jour. Amer. Chem. Soc., 41 (1919), No. 10, pp. 1531–1543, figs. 4*).—This paper gives the results of experiments undertaken to establish conditions for the development of a method for the determination of iron by means of the color developed in hydrochloric acid solution, and certain applications of the method as finally developed.

The temperature coefficient for the color varied from 2 to 3 per cent per degree, depending on the concentration of iron and probably also on the acidity. The color developed by a given amount of iron varied with the acid concentration, reaching a maximum intensity at from 26 to 28 per cent of hydrochloric acid. The use of constant-boiling acid is recommended as being the most satisfactory concentration. Sulphates were found to cause bleaching, and chlorids, particularly calcium chlorid, intensification of color.

A few results are quoted which show good agreement between the hydrochloric color method and the electrometric method of Hostetter and Roberts noted above.

**The genesis of petroleum as revealed by its nitrogen constituents,** C. F. MABERY (*Jour. Amer. Chem. Soc., 41 (1919), No. 10, pp. 1690–1697*).—A special volumetric method of analysis for the determination of minute amounts of nitrogen in oils is described, which is essentially a combination of the Dumas procedure for nitrogen and the oxygen combustion procedure for carbon. A

table is given showing the percentage of nitrogen in 21 samples of oil as determined by this volumetric process and by the Kjeldahl method.

The presence of nitrogen in the petroleum of all the principal oil fields is thought to furnish sufficient proof of the organic origin of these oils.

**Regeneration of Nessler's solution**, D. PULLMAN (*Analyst, 44 (1919), No. 517, pp. 124, 125*).—A method of regenerating Nessler's solution is described, which consists in recovering all the mercury and iodin of the solution by precipitation with a solution of a mercuric salt in amount equivalent to the mercury present, and using the mercuric iodid thus formed in the preparation of the Nessler's solution as follows:

A hot suspension of 431 gm. of the mercuric iodid in 500 cc. of water is treated with 31 gm. of zinc and the mixture stirred and heated for 5 minutes, after which the hot solution of zinc mercuric iodid is filtered, the precipitated mercury washed with boiling water, and the total filtrate made up to about 3,000 cc. with warm water. To this, after cooling, a saturated solution of mercuric chlorid is added, a few cubic centimeters at a time, until a distinct permanent red precipitate is formed. Then 540 gm. of sodium hydroxid, dissolved in about a liter of water, is stirred in quickly, and the volume made up to 5 liters. It is said that the best results are obtained with this solution by adding about 3 cc. to every 50 cc. of liquid to be nesslerized.

**The cause of and remedy for certain inaccuracies in Hausmann's nitrogen distribution method**, S. L. JODIDI and S. C. MOULTON (*Jour. Amer. Chem. Soc., 41 (1919), No. 10, pp. 1526–1531*).—To determine the sources of error in Hausmann's nitrogen distribution method a series of experiments, conducted at the Bureau of Plant Industry, U. S. Department of Agriculture, is reported in which the nitrogen distribution in casein was determined by the method as modified by Osborne and Harris (E. S. R., 15, p. 221), with the exception that varying amounts of magnesium oxid were employed.

It was found that the proportion of acid amid nitrogen was constant, and did not depend upon the amount of magnesium oxid employed in the distillation. The proportion of nitrogen found in the magnesium oxid precipitate was higher, and that of diamino and monamino nitrogen correspondingly lower, the greater the quantity of magnesium oxid employed in the distillation. These results were also corroborated in a study of the nitrogen distribution in spinach.

The authors conclude that "in order to obtain uniform results and a minimum of 'humin' nitrogen it is necessary to use the least possible amount of magnesia which is sufficient to render the substance to be distilled alkaline. In the case of plant and animal materials the uniform application of 1 gm. of magnesium oxid seems to be satisfactory, while in the case of proteins 0.5 gm. suffices."

**The modified Benedict method for the estimation of sulphur in feeds, feces, and foods**, J. O. HALVERSON (*Jour. Amer. Chem. Soc., 41 (1919), No. 10, pp. 1494–1503*).—The author, at the Ohio Experiment Station, has modified the Wolf and Österberg procedure (E. S. R., 24, p. 609) for the estimation of the total sulphur in solid organic matter by a simplified technique, which requires much less attention than the original method. The principal change in the process consists in digesting the material on the steam bath to almost complete solution with a diluted fuming nitric acid instead of heating with the fuming acid alone. The modified technique is as follows:

About 3.44 gm. of feces or 2.7476 gm. of feeds is weighed out on half a filter paper, which is then rolled up and put into a 300 cc. Kjeldahl flask. Ten or 15 cc. of hot water is added, the flask rotated occasionally (preferably

in the steam bath) to hasten the disintegration of any hard lumps. 20 cc. of a mixture of fuming and concentrated nitric acid (1:4, added, and the flask stoppered with a small funnel. After standing at room temperature for half a day, the flask is placed in the steam bath and allowed to digest slowly for about four days, with occasional rotation. Another 10 cc. of the acid mixture is then added, and the digestion is continued until the solution is clear or contains only small quantities of resistant residue. The solution is transferred in portions to a 60-cc. evaporating dish and treated with 20 cc. of the Benedict reagent during evaporation to complete dryness on the steam bath.

Blanks on the reagent are given the same treatment, with the exception that to prevent spattering or heating 5 cc. of a 10 per cent sucrose solution is added before evaporation to dryness. After the evaporation to dryness the samples and blanks are baked slowly on a gas hot plate or sand bath until the material has fused. After slow cooling, about 20 cc. of hot dilute hydrochloric acid is added and the dish is covered with a watch glass and heated on the steam bath for 15 minutes. The clear solution is then filtered into a 250 cc. beaker, made up to a volume of at least 100 cc., heated to boiling on a hot plate, and 10 cc. of a boiling 5 per cent barium chlorid solution added drop by drop from a calcium chlorid tube. The covered solution is digested on the steam bath for 2 or 3 hours, and then allowed to stand in the cold for at least 48 hours, after which it can be filtered without difficulty.

The method was checked by the modified peroxid method of Krieble and Mangum (E. S. R., 41, p. 505), which had been previously checked by the official peroxid method. Removal of the silica in feeds and feces gave results in the peroxid method agreeing closely with the new method, the latter checking the peroxid method within an average of 3.17 and 4.17 per cent, respectively, for feces and feeds.

**Estimation of small quantities of lead in foods and substances containing calcium phosphate**, B. W. J. Warren (*Analyst, 44 (1919), No. 519, pp. 199, 200*).—The technique of the method, which was devised to avoid loss of lead through occlusion with precipitated phosphates, is as follows:

Ten gm. of the material is incinerated in a silica dish, dissolved in a little water to which 1 cc. of nitric acid has been added, filtered, and washed. The colorless filtrate is treated with a slight excess of ammonia and the precipitate washed well. The precipitate, which contains practically all of the lead, is washed into a Nessler cylinder with water and 5 cc. of dilute acetic acid is added, followed by an aqueous solution of hydrogen sulphid. The color of the slightly turbid solution is matched with a standard consisting of a dilute lead solution treated in a similar manner with ammonia, dilute acetic acid, and finally hydrogen sulphid solution.

**The estimation of the approximate quantity of meat in sausages and meat pastes**, G. Stubbs and A. More (*Analyst, 44 (1919), No. 517, pp. 125–127*).—The method described has been in use in the Government Laboratory (England) in testing sausages under the Meat Rationing Order, 1918, of the Ministry of Food, which fixes the minimum quantity of meat in first quality and second quality sausages at 67 and 50 per cent, respectively. The method is based on the assumption that meat (beef, mutton, or pork) is free from carbohydrate and crude cellulose matter and contains a fairly uniform percentage of nitrogen calculated in the fat-free meat (3.75 per cent in beef and mutton and 4 per cent in pork), and that the substances used as fillers contain, when in condition suitable for mixing, about 40 per cent of water, about 50 per cent of carbohydrate and crude cellulose matter, and 1 per cent of nitrogen.

The determinations include water, fat and nonfatty solids, nitrogen, and ash. After estimating the amount of carbohydrate and crude cellulose matter and calculating the quantity of nitrogen associated with it, the balance of nitrogen is calculated to the quantity of defatted meat which it represents, and to this amount is added the fat, the total representing the amount of meat present.

**The analysis of sausages, meat pastes, and army rations,** A. W. STOKES (*Analyst, 44 (1919), No. 517, pp. 127–132*).—The method employed by the author in the analyses reported is based on the assumption that meat naturally contains 70 per cent, and bread 40 per cent, of water. The meat is dissolved by boiling in alcoholic soda solution, which also forms a soap with the fat. The insoluble matter is placed in an aqueous caustic soda solution to dissolve the starch, which is then precipitated by strong alcohol. Total solids, water, and ash are estimated in the usual way on 5 gm. of the material.

The actual fat is calculated on the assumption that the fatty acids equal 95 per cent of the actual fat. The dry meat is calculated by subtracting the weight of starch and fat from the total solids. To this is added 2.33 times its weight of water to give the fat-free flesh. The bread is estimated by adding to the starch 0.66 times its weight of water.

Tables are given of the composition of samples of sausages, meat pastes, and army rations, the determinations including percentage of fat, bread, flesh, water present, water allowed, and water excess.

**A rapid method for the determination of fat in cocoa and chocolate,** E. B. HUGHES (*Chem. News, 119 (1919), No. 3098, p. 104*).—The method, which involves the use of the Leffmann-Beam centrifugal machine or similar apparatus consists in centrifuging a 2 gm. sample of the finely powdered material twice with 30 cc. of 50 per cent alcohol, decanting and discarding the clear liquid, and subsequently centrifuging the residue twice with 25 cc. of a mixture of equal volumes of ordinary ether and petroleum ether. The ether extracts are decanted into a tared flask, the ether is distilled, and the residue of fat is weighed. It is stated that two extractions are usually sufficient, and that the extracted fat is free from impurity.

**A chemical test to distinguish between caffein and theobromin,** F. P. STROUP (*Amer. Jour. Pharm., 91 (1919), No. 9, pp. 598, 599*).—A color test to distinguish between caffein and theobromin is described which involves the use of a solution of potassium dichromate made by dissolving 0.05 gm. of the salt in 1 cc. of concentrated sulphuric acid.

The test consists in adding two drops of this reagent to a small amount of the alkaloid on a white porcelain surface. With caffein the yellow color of the reagent is changed almost immediately to a bright bluish-green, while with theobromin the color changes to a dark purple, later an olive-green, and finally to the same color as that given by caffein. Similar color changes are produced when the alkaloid is dropped upon a small amount of the potassium dichromate reagent on a white surface.

**Color standards for cottonseed oil,** H. V. ARNY, C. KISH, and F. NEWMARK (*Jour. Indus and Engin. Chem., 11 (1919), No. 10, pp. 950–953*).—The authors have examined the color standards "Co-Fe-Cu" and "Co-Cr-Cu," devised by Army and Ring (E. S. R., 35, p. 204), with reference to their suitability for the grading of cottonseed oil. The "Co-Fe-Cu" blends, the preparation of which is outlined, were found to be satisfactory for matching cottonseed oil when properly standardized. Approximately good matches were obtained when the oil samples and the standardized fluids were compared in 1-oz. round bottles, while practically perfect results were secured by placing the liquids in one-half inch cells in the Lovibond tintometer.

Tables are given of the analytical data obtained in the investigation.

**Lemon oil.—I. Fractional distillation and critical temperature of solution,** G. Ajon (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acireale, 4 (1916–1918), pp. 209–218, figs. 2*).—The critical temperature of solution in alcohol of a definite strength of the products of the fractional distillation of lemon oil is considered, by the author, to be a more accurate index of adulteration of the oil than the temperatures obtained in the fractional distillation of the oil.

Data are furnished which show that the later fractions of an adulterated oil have a lower critical temperature of solution in alcohol than the pure oil, while there is but little variation in the distillation temperatures of the pure and adulterated oils.

**The U. S. P. test for methyl alcohol in ethyl alcohol,** J. W. Ehman (*Amer. Jour. Pharm., 91 (1919), No. 9, pp. 594–597*).—As the result of a series of experiments undertaken to determine the cause of variable results obtained with the U. S. Pharmacopœia test for methyl alcohol the following modified procedure is recommended:

The fuchsin-sulphurous acid is prepared by dissolving 0.5 gm. fuchsin in 300 cc. of warm water, cooling and adding 11.2 gm. sodium sulphite (90 per cent) dissolved in 200 cc. of water, and finally adding 20 cc. hydrochloric acid. The other reagents and the method of procedure are the same as in the official test, with the exception that the technique proposed involves running a blank determination with pure 10 per cent ethyl alcohol and adjusting the temperature of both tubes to 25° C. after the addition of each reagent. If the blank is violet after ten minutes too high a temperature is indicated, while if a bright red color persists, too low a temperature. In either case the temperature should be varied and the test repeated.

With quantities of methyl alcohol of 1 per cent or more, the color produced is said to change from violet to purplish red in a few minutes when viewed either vertically or transversely, while with ethyl alcohol the solution is colorless or a pale yellow. With smaller quantities of methyl alcohol (0.25 to 0.5 per cent), 10 or 15 minutes are required for the test. The final color is pale violet when viewed from above under artificial light. Viewed transversely by daylight the solution may appear to be colorless.

**Notes on the assay of hypochlorite solutions,** F. X. Moerk and R. R. Foran (*Amer. Jour. Pharm., 91 (1919), No. 9, pp. 592, 593*).—Difficulty in obtaining definite end reactions in the assay of Dakin's solution and other hypochlorite solutions by the directions given in the Ninth Revision of the U. S. Pharmacopœia is attributed to the use of acetic acid in place of hydrochloric acid. The suggestion is made that for Dakin's solution the amount of acetic acid be increased from 2 to 3 cc. and for Labarraque's solution from 5 to 10 cc., if immediate titration is to be made. Other suggested possibilities of avoiding an indefinite end point are to allow the prepared test to stand one hour before titrating, or to replace the acetic acid by a diluted hydrochloric or sulphuric acid.

**The canning of apples.—Preventing pinholing,** W. D. Bigelow (*Canner, 49 (1919), No. 15, p. 34*).—The author states that pinholing or perforation of apple cans is caused by the action of malic acid in the apples on the tin plate, and may be prevented by using cans with a heavy tin coating, by tight sealing, so that external air will be absolutely excluded, by filling the cans completely, by expelling the air from the apple cells with a vacuum pump or with sufficient exhaust, and finally by allowing the cans to cool to the center before they are stacked away.

**Alcoholic fermentation of banana must,** R. Perotti and V. Rivera (*Staz. Sper. Agr. Ital., 50 (1917), No. 9–10, pp. 433–450; abs. in Abs. Bact., 2 (1918), No. 6, p. 339*).—A must obtained by the extraction of the skins and pulp of

bananas was found to contain four organisms, a saccharomyces designated *S. musæ*, a bacterial form not identified, a variety of *Oospora lactis*, and a variety of Mycoderma. Fermentation of banana must by means of *S. musæ* is said to yield, if sugar is added to the must, a slightly alcoholic liquor of good color and attractive organoleptic properties.

## METEOROLOGY.

**Temperature influence on planting and harvest dates**, J. B. KINCER (*U. S. Mo. Weather Rev., 47 (1919), No. 5, pp. 312–323, figs. 20*).—The author discusses certain significant temperature values which seem to establish the average spring planting dates of wheat, oats, early potatoes, corn, and cotton, together with the heat necessary to bring them to maturity after planting known as the "thermal constant" or "the accumulated day-degrees of temperature above the mean temperature at which planting is accomplished."

As thus computed, very little difference was found in the amount of heat necessary to mature most staple spring-planted crops when the average variety of corn was considered. It is suggested that the mean temperature at which the planting of a given crop takes place be employed as a base for any method of temperature summation rather than a general base for all crops. It is stated that the normal daily temperatures accompanying the beginning of the seeding of the principal spring-grown crops are from 37 to 40° F. for wheat, 43° for oats, 45° for early potatoes, 55° for corn, and 62° for cotton. The successful commercial production of cotton and corn is said to be limited by available thermal constants of approximately 2,000° and 1,600°, respectively.

**Agricultural meteorology** (*Science, n. ser., 50 (1919), No. 1293, pp. 350, 351*).—Recent publications on the subject are noted, attention being called especially to the following articles published in the *Monthly Weather Review:* Relation Between Vegetative and Frostless Periods, by J. B. Kincer (E. S. R., 41, p. 118); and Temperature Influence on Planting and Harvest Dates, by J. B. Kincer; Alfalfa Growing in Western South Dakota, by H. N. Johnson, and Alfalfa Seed Growing and the Weather, in Utah, by J. C. Alter, of all which are noted elsewhere in this issue.

**Monthly Weather Review** (*U. S. Mo. Weather Rev., 47 (1919), Nos. 5, pp. 279–365, pls. 26, figs. 39; 6, pp. 367–446, pls. 16, figs. 28*).—In addition to special forecasts and warnings, river and flood observations, notes on the effect of weather on crops, halo phenomena, and seismological reports for May and June, 1919; lists of additions to the Weather Bureau library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during May and June, 1919; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

*No. 5.*—The First Trans-Atlantic Flight (illus.) by W. R. Gregg; The Flight of Hawker and Grieve, by W. R. Gregg; A New Evaporimeter for Use in Forest Studies (illus.), by C. G. Bates (see p. 725); The Measurement of Rainfall and Snow, by R. E. Horton (Abs.) (E. S. R., 40, p. 715); The Relation of Rainfall to Configuration, by C. Salter (Rev.) (E. S. R., 41, p. 510); Storm Rainfall of Eastern United States; Panama Rainfall (illus.), by H. G. Cornthwaite; Uncle Sam's Dampest Corner (illus.), by G. K. Larrison (see p. 717); Additional Meteorological Data Needed by Engineers, by R. E. Horton (reprinted); Elements of Hydrology, by A. F. Meyer (Rev.); The Weather and Daily Stream Flow for Hydro-electric Plants (illus.), by J. C. Alter; The Colorado River (illus.), by F. H. Brandenburg; Water Supply in California, by A. H. Palmer (Abs.); Temperature Influence on Planting and Harvest Dates (illus.), by J. B.

Kincer (see p. 716); A Graphic Summary of Seasonal Work on Farm Crops (illus.), by O. E. Baker, C. F. Brooks, and R. G. Hainsworth (Abs.); Dufrenoy's Observations of the Temperatures of Plants in Sunlight and Shade; Note on the Heating of Plants in Sunlight as a Factor in Growth, by D. A. Seeley; Measuring the Temperature of Leaves, by E. B. Shreve (reprinted rev.); Alfalfa Growing in Western South Dakota (illus.), by H. N. Johnson; and Alfalfa Seed Growing and the Weather, in Utah, by J. C. Alter (see p. 732).

*No. 6.*—Some Observations on Temperatures and Winds at Moderate Elevations Above the Ground (illus.), by V. E. Jakl; Results of Some Empiric Researches as to the General Movements of the Atmosphere (illus.), by H. H. Hildebrandsson (translation); General Circulation of the Atmosphere, by L. Gangoiti (Abs.); Thunderstorm at Tulsa, Okla., June 6, 1919 (illus.), by J. A. Reihle; Tornado at Fergus Falls, Minn., June 22, 1919 (illus.); Hailstorms in South Carolina, June 8 and 9, 1919 (illus.), by R. H. Sullivan; Suggestions as to the Conditions Precedent to the Occurrence of Summer Thunderstorms, with Special Reference to That of June 14, 1914 (illus.), by J. Fairgrieve (Abs.); Wind Stratification Near a Large Thunderstorm (illus.), by L. A. Warren; Pressure Fluctuations During a Thunderstorm (illus.), by E. F. Pigot; Mammato-Cumulus Clouds and Thunderstorm at Binghamton, N. Y., June 24, 1914 (illus.), by J. R. Weeks; Types of Mammato-Cumulus Clouds (illus.), by C. F. Brooks; Cloud Shadows (illus.), by H. H. Martin; Measuring Visibility, by A. H. Thiessen; The Aurora of March 7–8, 1918 (illus.), by H. Lyman and C. F. Brooks; Wolfer Provisional Sun-spot Relative Numbers; The Weather Data Needed by Eclipse Expeditions (reprinted); Land and Sea Breezes in the Vicinity of Corpus Christi Bay, Tex. (illus.), by C. E. Heckathorn; Land and Sea Breezes at Bayonne, France, by M. Rouch (Abs.); The Sea Breeze on the Coast of Catalonia, by E. Fontseré (reprinted rev.); Land and Sea Breezes at Sierra Leone (reprinted); The First Successful Non-stop Trans-Atlantic Flight, by W. R. Gregg; Ocean Weather Reports and Forecasts for Aviators (reprinted); New World's Airplane Altitude Record; A New Recension of Aristotle's Meteorology, by F. H. Fobes (Rev.); Lord Rayleigh, Meteorologist, 1842–1919; Richard H. Curtis, 1847–1919 (reprinted); Unification of the Astronomical with the Meteorological Day (reprinted); Further Note on the Hurricane of August 6, 1918 (illus.), by R. A. Dyke; Panama Rainfall (illus.), by H. G. Cornthwaite; and Panama Cloud Phenomena (reprinted).

**Uncle Sam's dampest corner,** G. K. Larrison (*U. S. Mo. Weather Rev., 47 (1919), No. 5, pp. 303–305, pls. 2, figs. 2*).—Measurements by engineers of the U. S. Geological Survey of rainfall in the Hawaiian Islands, at various elevations up to more than 5,000 ft., showed that during a period of nearly five years the average annual rainfall on Mount Waialeale, elevation 5,080 ft., was 476 in. The records show a great contrast in amounts of rainfall at stations only a few miles apart but varying considerably in altitude or exposure. Special forms of rain gauges and methods used in obtaining the records are described.

"As a rule November, December, March, and April are the wettest months, although the rule is not 'hard and fast,' and records are available showing just the reverse. A comparison of local records with those on the mainland northwest indicates no relation whatever in seasonal precipitation . . . Hawaiian precipitation is also of the 'showery' class, and heavy rains rarely last more than a few hours. The applicability of the general rule—that even in wet periods heavy downpours lasting a few minutes are interspersed with short periods of sunshine—varies considerably with the altitude and location. In the upper valleys, with few exceptions, showers are daily occurrences, even in

dry weather, though on extreme leeward points showers are rare. On the high peaks, like Mount Waialeale and Puu Kukui, the mornings are usually clear and the afternoons and nights very wet."

**Annual report of the [Philippine] Weather Bureau for the year 1916** (*Ann. Rpt. [Philippine] Weather Bur., 1916, pt. 3, pp. 341*).—Daily records of observations on pressure, temperature, precipitation, humidity, wind, and clouds for each month of 1916 at the 51 secondary stations constituting the Philippine meteorological service are tabulated. Observations at 2, 6, and 10 a. m., and 2, 6, and 10 p. m., at the first and second class stations and at 6 a. m. and 2 p. m. at the third and fourth class stations are recorded.

**Climate and meteorology,** M. FRASER (*New Zeal. Off. Yearbook 1918, pp. 52–62, pls. 2, figs. 2*).—Climatic data, especially rainfall and temperature, for 1917, are summarized.

## SOILS—FERTILIZERS.

**Instructions for the sampling of soils,** H. LAGATU (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 40 (1919), No. 39, pp. 298–303, fig. 1*).—Information is given regarding the sampling of soils for analysis.

**Analyses of soils of Turner County,** W. A. WORSHAM, JR., ET AL. (*Ga. State Col. Agr. Bul. 182 (1919), pp. 30, figs. 3*).—Analyses of samples of the representative soil types of an area of 177,920 acres in south-central Georgia are reported and discussed.

Over 65 per cent of the soils of the area are classified as sandy loam. The analyses indicate a relative deficiency in all the nutritive elements, nitrogen being relatively in minimum and potash being relatively in maximum. The soils are also in need of lime and organic matter and deeper cultivation.

**Lime and magnesia in Queensland soils,** J. C. BRÜNNICH (*Queensland Agr. Jour., 11 (1919), No. 4, pp. 162–169*).—A summary of the results of analyses of 1,773 samples of Queensland soils conducted at the Sugar Experiment Station is reported, showing that 27.64 per cent of the soils contain less than 0.25 per cent calcium oxid, 44.7 contain from 0.25 to 0.75, 21.1 contain from 0.75 to 1.5, and 6.8 per cent contain over 1.5 per cent calcium oxid; and 35.7 per cent contain less than 0.25 per cent magnesium oxid. Comparing the contents of lime and magnesia, it is shown that 34 per cent have a magnesia-lime ratio of 1:1, and 6.6 per cent have a ratio of 1:3.

**Some observations about the soils of the Northeast Indian tea districts,** G. D. HOPE (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 102–113, pls. 2*).—This is a description of the tea soils of Northeast India, with special reference to their origin, and mechanical and chemical composition.

These soils are all of alluvial origin, with the exception of those on certain steep slopes. Alluvium derived from tertiary sandstone has several distinguishing characteristics, chief among which is the invariably high percentage of fine sand and its even composition to a great depth over extensive areas. It is deficient in nutritive constituents, organic matter, and lime.

In a special study of this alluvial soil it was found to consist mainly of four definite subtypes, in all of which fine sand is the chief ingredient. There is a definite gradation in quantity from fine sand through silt and fine silt to clay, while the amount of coarse sand varies, and this variation is chiefly responsible for the difference in type. "Wherever the hills bordering the plains consist of rock other than sandstone, a difference in the type of soil is immediately noticeable. . . .

"A very much larger part of the Dooars tea districts, relatively to that of the others, is made up of the old red soils known as the Red Bank. This soil is of great depth and is characterized by being comparatively rich in coarse

sand and clay, and poor in fine sand, silt, and fine silt. It is a loam, though a heavy loam, rather than a silt soil, and is capable of assuming a very fine tilth if well cultivated. These red soils are usually acid, contain very little lime, and are rather deficient in phosphoric acid, and citric acid-soluble phosphoric acid is low. A very important feature of these soils is the fact that the ratio of clay to fine silt is usually high, which fact, taken with others, indicates that the soil has been in situ long enough to have weathered considerably."

The next most characteristic soil is a gray sandy loam. "These soils have been deposited from the rivers which come down from the Himalayas, and they consist of coarse or fine quartz sand accompanied by a large percentage of talc and potash mica. They possess fairly high percentages of phosphoric acid and remarkably high figures for citric acid-soluble phosphoric acid. They are rich in potash and the percentage of citric acid-soluble potash is unusually low, and is often present in traces only."

Other soils of special character are described.

**Contribution to the knowledge of the soil profile in the neighborhood of Buitenzorg [Java]**, J. D. White (*Meded. Landbouwhoogsch. [Wageningen], 16 (1919), No. 3, pp. 57–88, pls. 3*).—This is a report of mineralogical, physical, and chemical studies of the soil profile in the vicinity of Buitenzorg in eastern Java.

This profile is divided into four layers, A, B, C, and D, of which B, C, and D constitute a fossil soil of one geological origin over which is layer A, a well-weathered brown soil of volcanic origin. Layer B-C-D is in a much more advanced stage of weathering and decomposition than layer A. Both layers are, however, considered to be stages of lateritic decomposition. Another layer of soil called CX is a yellow soil. This color is ascribed to the presence of augite, and it is thought that this is less weathered than B-C-D and more than A. It is also considered a stage of lateritic decomposition.

It is generally concluded from these studies that hygroscopicity is a fair measure of the degree of weathering of soils of similar origin and type of weathering.

**The physical texture of soils in its relation to crop production**, D. Clouston and A. R. Padmanabha Aiyer (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 89–94, pls. 2*).—This is a brief description of the laterite soils of the Central Provinces, which contain about 69 per cent of gravel and stone and only 31 per cent of fine soil. It has been found that owing partially, at least, to the porosity of this soil, it can be made relatively productive by irrigation, cultivation, and manuring.

**Phenomena of clay plasticity explained**, R. F. MacMichael (*Brick and Clay Rec., 55 (1919), No. 8, pp. 677–680, figs. 2*).—This is a technical description of the causes of plasticity in clay as well as other physical characteristics of clay on the addition or expulsion of fluids, based on several years of experiments.

It has been found that the strength of clay, whether plastic, dry, or burned, is due to the molecular cohesion of the clay particles themselves. Water, when added to a mass of dry clay, produces a disruptive force within the mass, opposing cohesion and reducing the strength of the clay. Plasticity results from a balancing of the forces of cohesion and disruption. Fluids other than water may be used to produce plasticity in clay. Organic matter, soluble salts, and colloids, except as the latter are considered to be merely very fine, insoluble particles of the clay itself, are not essential to plasticity. Shrinkage is considered to be merely a rearrangement of the clay grains.

Chemical reactions of the soil, MARTIN and WIRBEL (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 8, pp. 246–252*).—This is a brief review of studies on the chemical reactions in soil between acid and alkaline soil solutions and the effect thereon of soil colloids.

It is concluded that clay, silica, and humus should be considered not especially as colloids possessing the power of absorbing the bases of soluble fertilizers, but more particularly as catalyzers permitting a speed of reaction between salts in accordance with the more or less rapid transformation of the character of the soil. It is thought that precipitated phosphate should give as good results as superphosphate in soils, on the grounds that under the influence of soil colloids and calcium carbonate in the presence of alkaline salts a gradual dissolution of the phosphate takes place. The improvement of tough soils by the incorporation of organic matter is explained on the basis that the presence of so-called humic acid prevents the dissolution of silica to a large extent. It is further pointed out that the manner of fixation and dissolution of phosphoric acid in soil is the same as that of potash or ammonia.

Soils and soil conditions, W. H. HARRISON (*Sci. Rpts. Agr. Research Inst. Pusa, 1917–18, pp. 27–30*).—Studies of the relationship of the gaseous products of decomposition to paddy soils have shown that carbon dioxid when present alone can persist as such, but that in admixture with hydrogen and under biological influences a recombination occurs of such intensity that the absence of any large quantity of these gases from the atmosphere in paddy soils is accounted for. Incidentally, distinct evidence has been obtained to show that marsh gas can be produced by a combination of these two gases under biological influences. The important fact has also been obtained that this reaction between carbon dioxid and hydrogen is not peculiar to paddy soils, but that it can be induced in dry soils with the utmost ease when the conditions are approximately anaerobic in character.

Pot experiments with sterile so-called "bara" soils after the salts present had been washed out with ordinary water resulted in the almost entire inhibition of germination. An examination of the soil showed that the bicarbonate of lime in the water had brought about a reaction leading to the production of alkaline carbonate in the soil. The soil experimented with originally contained a comparatively small amount of alkaline carbonate and a considerable proportion of sulphates and chlorids, whereas after the washing process the sulphates and chlorids were reduced in amount, but the carbonate content had considerably increased, so that the effect had been to change the original condition of white alkali into one of black alkali.

Preliminary experiments in relation to the reactions occurring between calcium phosphates and calcium carbonate under varying conditions showed that "superphosphate reacts very rapidly at ordinary temperature with calcium carbonate, the product of the reaction being the comparatively insoluble dicalcic phosphate, and that the latter in turn slowly reacts with more $CaCO_3$ forming tricalcic phosphate. At higher temperatures the intermediate stage practically disappears and tricalcic phosphate is formed with great rapidity."

Soil biology, J. MACKENNA (*Rpt. Prog. Agr. India, 1917–18, pp. 101–103*).—Field studies on the seasonal variation and effect of cropping and of fallow on soil nitrification showed that the presence of a crop, while diminishing the apparent amount of nitrification as measured by the nitrate found in the soil, actually increased the amount if it is assumed that the crop takes its nitrogen entirely as nitrate. Experiments on the specific nature of various strains of *Bacillus radicicola* and upon apparent symbiotic fixation of nitrogen without

nodule formation, in the case of inoculation with foreign strains gave clear evidence of stimulation of growth by nonsymbiotic nitrogen fixation both by azotobacter and nodule organisms. The practice of pitting and rotting a green manure crop before applying it to the land has been found to give crops as good as those raised after green manuring in the usual way.

Studies on the phosphate requirements of soil bacteria led to the conclusion that "increase in available phosphoric acid greatly increases the general bacterial activity of a soil, and therewith the formation of carbon dioxid. There is a positive relation between the amounts of carbon dioxid thus formed and the solubilization of phosphate in the soil, but this varies with the character of the latter." Addition of soluble phosphate increased the ammonification rate in all the soils examined. Addition of phosphate in many cases diminished the nitrification rate, apparently owing to the disproportionate increase in nonnitrifying organisms. The final result over long periods of time in most cases showed no increase in the total nitrate formed.

Studies on the nitrogen content of liquid manure, II–IV, E. Blanck (*Landw. Vers. Sta., 91 (1918), No. 5–6, pp. 253–269, 271–290, 309–346*).—These three articles explain more in detail experiments previously noted (E. S. R., 40, p. 723).

II. *The transformation of the nitrogen of urine in soil.*—Studies on the chemical and bacteriological transformation of the nitrogen of liquid manure in light sandy soil are reported, in which it was found that bacterial decomposition of urine in sandy soil began very quickly. While this action was somewhat retarded by phosphate treatment, eventually the loss of nitrogen through the formation of ammonia assumed large proportions. This led to the conclusion that the conservation of liquid manure with acids is unprofitable. No nitrification of the ammonia formed was observed, this being attributed to the deficiency in lime of the sandy soil. It was found that during nine weeks nearly 75 per cent of the total nitrogen in urine added to sandy soil was lost. It is concluded that the use of liquid manure on light sandy soils deficient in lime is not to be recommended.

III. *The loss of nitrogen from liquid manure and urine due to their use as top-dressings.*—Experiments on the loss of nitrogen from urine and liquid manure when used as a top-dressing on light sandy soil and when mixed into the soil are reported.

It was found that the greatest loss of nitrogen from urine and liquid manure took place during the time of addition and the sinking of the liquid into the soil. Smaller losses took place through evaporation and escape of free nitrogen while the liquid lay in the soil. The washing out of nitrogen from the soil by atmospheric movement is not considered great. A nitrogen loss due to the evaporation of urine or manure liquid was also observed, the older the urine the greater being the loss of nitrogen. Mixing the liquid under the soil prevented the nitrogen losses only partially, but the losses decreased as the depth of mixing increased. Treatment of urine and liquid manure with sulphuric acid was found to be a better method of preventing nitrogen losses.

IV. *The influence of formalin and sulphuric acid on the conservation and fertilizing action of liquid manure nitrogen.*—Studies are reported in which it was found by cropping experiments that liquid manure neutralized with sulphuric acid gave as good results as ammonium sulphate. The liquid manure kept in air gave considerably poorer results than the liquid neutralized with sulphuric acid and the ammonium sulphate, but gave much better results than liquid manure treated with either 5 or 10 per cent formalin solution. Liquid manure treated with formalin gave very poor results with reference to its

nitrogen content, and this was more marked the greater the concentration of formalin solution used. It is concluded that a marked decrease in the value of liquid manure results from the addition of formalin.

**Action of chemical fertilizers on mountainous prairies**, C. DUSSERRE (*Ann. Agr. Suisse, 18 (1917), No. 1, pp. 7, 8*).—Two years' experiments with grain and leguminous crops on mountain prairie soils which are gravelly and relatively deficient in lime are reported.

The best results were obtained with a mixture supplying phosphoric acid and potash, while about the same results were obtained where phosphoric acid alone was added and where phosphoric acid, potash, and nitrogen were added, slightly poorer results being obtained in the latter case. It is concluded that the use of Thomas slag and 30 per cent potash salts is profitable on these soils. Nitrogenous fertilizers such as sodium nitrate or ammonium sulphate are beneficial if applied in moderate amounts.

**Experiments on the action of different fertilizers manufactured from peat**, TACKE (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 36 (1918), No. 22, pp. 369–373*).—Pot culture experiments with oats on an unproductive sand soil to which a specially prepared moor soil fertilizer and a peat silica fertilizer were added at the rate of about 100 kg. of nitrogen per hectare (89 lbs. per acre) are reported.

The growth of oats in both cases was very poor, but was materially improved by an addition of sodium nitrate, showing the need of the soil for nitrogen. The action of the humus fertilizers was very weak, and the increase in crop attributed to them was very small. Liming had little effect in furthering their action, the increase in the case of the peat silica fertilizer being attributed to a decrease in assimilation of silica rather than an increase in nitrogen assimilation due to liming.

Further experiments are reported with oats on an unproductive heather sand soil to which lowland moor soil untreated and treated with hydrochloric acid was added. The soil used was found to be in need of nitrogen. Neither the natural moor soil nor the treated moor soil appeared to function as an active source of nitrogen for the crop. It is concluded that the question of the so-called humus fertilizer needs further investigation before practical results may be expected.

**Investigations on the absorptive power of peat litter for nitrogen in the form of liquid manure or ammonia**, H. MINSSEN (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 37 (1919), Nos. 6, pp. 63–72; 7, pp. 197–206; 8, pp. 217–223*).—Laboratory experiments are reported in which it was found that slightly decomposed new sphagnum peat is especially adapted for the conservation of liquid animal excrement on account of its extraordinary high absorptive power for liquids and its marked power for combining physically and chemically with ammonia. The power of combining chemically with ammonia was found to depend on a high content of so-called humus acids. Considerable quantities of nitrogen were physically absorbed by peat kept moist, well packed, and protected from air and sun. The chemically combined nitrogen was found in different forms but mostly in what were considered to be ammonium humates, which are not very resistant to the action of high temperatures or strong acids or alkalis. Other nitrogen compounds were found to be practically insoluble. It was also found that peat, on account of its acid nature, was capable of taking up ammonia out of the air and combining with it as permanently as out of solutions. Peat saturated with ammonia was found to be useful as a fertilizer and to give excellent results in pot experiments with sandy soil and barley as compared with sodium nitrate. As much nitrogen was absorbed chemically from urine as from ammonia.

**Utilization of nitrogenous refuse**, E. Donath and G. Ulrich (*Chem. Ztg., 1917, No. 20, pp. 165–168; abs. in Ztschr. Angew. Chem., 31 (1918), No. 56, Ref., p. 218; Chem. Abs., 13 (1919), No. 9, p. 985*).—It has been found that when refuse such as leather and horn waste, which is rich in nitrogen, is heated with waste sulphuric acid to about 300° a portion of the nitrogen is converted into ammonium sulphate and recovered, and the remainder is obtained in the form of a highly nitrogenous charcoal. Products which are practically dry and rich in ammonium sulphate are obtained by heating for several hours at over 240°. If large proportions of acid are used, pasty products are obtained from which fertilizer mixtures may be prepared by combining them with ground lime or phosphate. The yield of ammonium sulphate can be increased by carrying out the process in the presence of certain catalytic agents at preferably 250 to 270°.

**Field trials with the newer nitrogenous fertilizers**, S. Rhodin (*K. Landtbr. Akad. Handl. och Tidskr., 57 (1918), No. 7–8, pp. 443–471; abs. in Chem. Abs., 13 (1919), No. 9, p. 986*).—Tests of calcined catalyzers for use with calcium cyanamid to improve its physical condition are reported. The catalyzers consisted mostly of by-products from iron and stone works containing iron, manganese, and aluminum. Sodium chlorid and powdered charcoal were also used.

The results of field trials were so contradictory with respect to most of the catalyzers that no definite conclusions could be drawn except regarding powdered charcoal. The pronounced results obtained with this substance are thought to be due to its great absorptive power. Further field trials comparing Chili sodium nitrate with Norwegian nitrate, basic Norwegian nitrate, calcium cyanamid, German ammonium sulphate, Swedish ammonium sulphate, and Norwegian ammonium nitrate are reported. The largest crop increase was obtained with ammonium nitrate followed by the different other nitrates, all of which gave essentially the same results. Ammonium sulphate was third in value, and the smallest crop increases were obtained with calcium cyanamid.

**Recovery of high percentage calcium phosphate in connection with ammonia in fecal matter**, J. Gonne (*Chem. Ztg., 43 (1919), No. 10, pp. 39, 40; abs. in Chem. Abs., 13 (1919), No. 12, p. 1355*).—A combined distillation and precipitation process is very briefly described for the recovery of ammonia in different commercial forms and of phosphates of 40 to 44 per cent water solubility with a by-product of a fertilizer similar to guano.

**Bisulphate superphosphate**, G. Lefort (*Vie Agr. et Rurale, 9 (1919), No. 36, pp. 172–176*).—This is a discussion and brief description of the manufacture of superphosphate by treatment of phosphate rock with sodium bisulphate instead of sulphuric acid. Analyses show that such superphosphate contains from 8 to 10 per cent water-soluble phosphoric acid and from 9 to 12 per cent citrate-soluble phosphoric acid. It also contains from 21 to 25 per cent of sodium sulphate.

**Comparative results with different phosphatic manures** (*County Northumb. Ed. Com., Bul. 29 (1919), pp. 35–38*).—Comparative tests of high, low, and medium grade slags and bone meal with hay showed that the slag of greatest citrate solubility gave poorer results than the slag of medium citrate solubility, but better than the slag of lowest citrate solubility. Bone meal gave on the average poorer results than basic slag.

**New experiments in potash fertilization**, H. G. Söderbaum (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 177 (1918), pp. 14; also in K. Lantbr. Akad. Handl. och Tidskr., 57 (1918), No. 7–8, pp. 501–512; abs. in Chem. Abs., 13 (1919), No. 9, p. 986*).—Experiments are reported with salts made up to simulate such salts as may be obtained by the evaporation of sea water, and char-

acterized by a low content of potassium chlorid and high contents of sodium chlorid and calcium chlorid. Experiments with oats showed that the presence of chlorin up to a certain amount was beneficial to the formation of grain, but that it was very injurious beyond this point. The most significant result obtained was that a large amount of chlorin can be tolerated in the presence of a sufficient amount of lime, which is taken to indicate that marine salts can be used on soils well supplied with lime.

Further experiments are reported with potash lime, manufactured by mixing one part of feldspar of high potassium content, one part limestone, and one part gypsum, all finely ground, briquetted, and burned at 1,180° C. Larger crop yields were obtained with this fertilizer on a soil deficient in lime than with a mixture of 80 per cent potassium chlorid, 10 per cent sodium chlorid, and 10 per cent calcium chlorid. The good results obtained with potash lime are in a measure ascribed to its lime content.

**Lime and chalk: The pressing need for these on Essex soils**, G. S. Robertson (*Essex Ed. Com., East Anglian Inst. Agr., Chelmsford, Bul. 24 [1919], pp. 16*).—This pamphlet discusses the use of lime and chalk on Essex soils. Analyses of about 90 samples of Essex soils show them to be relatively deficient in lime, which deficiency it is thought has limited their productive capacity. General information on the purchasing and use of lime is also given.

**By-product lime**, B. Kosmann (*Tonindus. Ztg., 42 (1918), pp. 579, 580; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 23, pp. 744A, 745A; Chem. Abs., 13 (1919), No. 9, p. 985*).—This is a very brief summary of the various processes patented for preparing a lime fertilizer from the waste liquors obtained in the extraction of potassium from the Stassfurt salts. They consist essentially in treating the liquor with an excess of calcium oxid. Magnesium hydroxid and calcium chlorid are formed, and these together with an excess of lime form the principal constituents of the product. An analysis of one sample showed a content of 9 per cent magnesium hydroxid, 50 per cent calcium hydroxid, and 34.26 per cent calcium chlorid.

**Agricultural utilization of tanning wastes**, B. Fallot (*Vie Agr. et Rurale, 9 (1919), No. 36, pp. 180–182*).—This is a brief discussion of tanning waste with reference to its fertilizing value.

Analyses show that average tanning waste contains important amounts of phosphoric acid, potash, and lime, and a certain amount of nitrogen. It is stated that the tannic acid present may be neutralized with lime or removed by treatment with a solution of iron sulphate.

**Fertilizer analyses [and registrations]**, A. F. Woods and H. B. McDonnell (*Md. Agr. Col. Quart., No. 85 (1919), pp. 40*).—This pamphlet presents the results of analyses and valuations of 661 samples of fertilizers and fertilizing materials made in Maryland from March to July, 1919, together with a list of firms and brands registered for 1919, and the text of the Maryland fertilizer law.

## AGRICULTURAL BOTANY.

**Researches on growth and movement in plants by means of the high magnification crescograph**, J. C. Bose and G. Das (*Proc. Roy. Soc. [London], Ser. B, 90 (1919), No. B 631, pp. 364–400, figs. 17*).—Describing the construction and operation of the crescograph, by which it is stated very small movements can be made to register their direction and amount on a greatly enlarged scale, the authors give an account of the employment of this appliance for making graphic records in the study of very small or brief movements of plants in growth or response to stimulus; also of the relations of each of these

to the other, and more particularly in tropisms of several sorts which are indicated. A study is reported of the relation between response and stimulus of growing and of nongrowing organs. Some of the more important results thus far obtained from experiments are outlined.

Growth rate under lowering temperature undergoes diminution, and arrest at a definite temperature. Temperature rise enhances growth rate to an optimum, after which a decline sets in. At 60° violent contraction occurs, which is termed the spasm of death. The effect of heat is an increase in growth rate, which is retarded by radiation. Very close parallelism has been established between the response given by pulvinated and that by growing organs. Every stimulus gives rise to distinct impulses in two directions, namely, a rapidly propagated hydropositive impulse independent of tissue conductivity, and a slowly propagated excitatory negative, dependent upon conducting power and considered as a phenomenon of conduction of protoplasmic change. The former impulse gives rise to expansion, the latter to contraction. Transverse conductivity in the organ is much less than its longitudinal conductivity.

It is claimed that a general statement of the effect of all kinds of stimuli may be made in the form of the law that direct application of stimulus induces contraction and indirect expansion. All induced movements of plants under environmental changes are, therefore, the definite effects of direct or indirect stimulation.

**A new evaporimeter for use in forest studies**, C. G. Bates (*U. S. Mo. Weather Rev., 47 (1919), No. 5, pp. 283–294, pl. 1, figs. 4*).—This article gives an account of the development and operation of a device, designated as Type 4 "sun" wick evaporimeter, which is claimed to give the nearest approach yet attained to complete duplication of the physical features of the plant leaf in relation to the factors which are influential as regards its response to evaporation stimuli. The Type 4 evaporimeter is said to parallel the total transpiration of 12 small coniferous trees more closely than does any other instrument yet devised. The instrument is described in detail with enumeration of the advantages claimed for the different features. It is said to be eminently practical, integrating solar and atmospheric conditions in much the same way as does the plant, and no new difficulties presenting when it is used for climatological studies continuing throughout the year.

**The temperature coefficient of photosynthesis**, W. J. V. Osterhout and A. R. C. Haas (*Jour. Gen. Physiol., 1 (1919), No. 3, pp. 295–298*).—The authors have studed photosynthesis in the plant (*Ulva rigida*) previously noted (E. S. R., 41, p. 523), which forms thin layers permitting adequate control of temperature. This was kept within about 1° of a chosen constant (17 and 27° C.) in sea water containing an indicator and exposed to direct sunlight. Values were obtained from which the authors conclude that the true coefficient of photosynthesis in that plant within the limits here employed is 1.81. They suggest an explanation based upon the assumption that the process involves a light reaction with a low coefficient, followed by an ordinary reaction with a high coefficient.

**Changes of electrical conductivity under geotropic stimulation**, J. Small (*Proc. Roy. Soc. [London], Ser. B, 90 (1918), No. B, 630, pp. 349–363, figs. 14*).—The author has made a study of the resistance of the root tip of *Vicia faba* to the electrical current. The present investigation is claimed to have shown that the mechanism of geotropic response by the roots depends upon changes in permeability, the perception of gravity by plants being thus brought into line with response in animals to the same stimulus. The claim that the

perception of gravity in plants is a protoplasmic phenomenon is considered to be proved by the record of the change in the second millimeter of one side of the root tip in the case of *V. faba* at various angles to the vertical. These changes are said to show the same curve as is shown by animal tissues in response to stimuli.

Permeability increases in the cortical cells of both the upper and lower sides (but chiefly in those of the latter) of the root tip when the root is placed at an angle to the vertical. The consequent relatively greater turgidity of the cells of the upper side explains the curvature. The increased permeability, giving decreased turgor, on both sides of the root is supposed to explain retardation or elongation of the axis during the period of curvature.

**The translocation of the mineral constituents of the jack bean**, G. D. BUCKNER (*Jour. Amer. Chem. Soc., 41 (1919), No. 2, pp. 282–287*).—Certain features of experimentation along the lines previously indicated with Lima beans (E. S. R., 34, p. 427) having proved somewhat unsatisfactory, the author found the jack bean (*Canavalia ensiformis*) more suitable to the purpose. He carried out experimental studies on the material taken from the cotyledons by the young plant during early growth, and on that remaining in the cotyledons after the seedlings had died, apparently from exhaustion.

It was found that the jack bean retains considerable calcium, magnesium, phosphorus, and silicon in the cotyledons during the growth of the seedlings in distilled water, large accumulation of these materials occurring in the leaves and a much smaller relative amount in the roots. The largest proportion of these translocated elements is found in parts having the greatest surface (therefore being capable of the greatest anabolic activity and evaporation). The considerable proportion remaining in the cotyledons is supposed to indicate the activity of this part of the mineral matter in promoting catabolic changes.

The paraffined paper cups and the method employed have proved very satisfactory for growing seedlings, while successfully excluding entraneous mineral matter. Other experiments in progress are expected to throw further light on the physiology of germination and the nutrition of embryos. It is thought that other uses in physiological investigations may be made of deductions which may be drawn from the data here presented.

**Studies on anthocyanins: Color variation in anthocyanins**, K. and Y. SHIBATA and I. KASIWAGI (*Jour. Amer. Chem. Soc., 41 (1919), No. 2, pp. 208–220, figs. 16*)—Departing from the custom of using metallic zinc or magnesium and excess of inorganic acid for the reduction of the flavone and the flavonol series, the authors have employed organic acids, and have been able to isolate some of the pigments and to examine their properties. The work and results are discussed in detail.

**The function of wood vessels**, E. GILTAY (*Ztschr. Bot., 10 (1918), No. 12, pp. 753–756, fig. 1*).—An account is given of the construction and operation of a device which, by internal reflection and resulting concentration of strong light, gives a good view of the end of a plant stem cut a little above the soil. By continually wiping dry the cut surface, it was seen that in the specimen described (*Sambucus nigra*) the flow was limited to the vessels.

**Mendelism and the cytological mechanism of heredity**, Y. DELAGE and M. GOLDSMITH (*Rev. Sci. [Paris], 57 (1919), Nos. 4, pp. 97–109; 5, pp. 130–135*).—This is an exposition and critique of the Mendelian theory of heredity with its implications.

**Gametogenesis and fecundation in Zea mays as the basis of xenia and heredity in the endosperm**, P. WEATHERWAX (*Bul. Torrey Bot. Club, 46 (1919),*

*No. 3, pp. 70–90, pls. 2, figs. 2*).—Summarizing experimental and other evidence as presented, the author states that of the four potential megaspores in maize only one persists and becomes functional. The embryo sac is a modified form of the ordinary 7-celled type. The antipodals undergo division. The sperms are matured inside the pollen grain. Although external conditions and length of the silk determine the time required for the growth of the pollen tube, fecundation has occurred about 24 hours after pollination. The work of Guignard on double fecundation (E. S. R., 13, p. 620) is conidered as verified by these observations. A triple fusion occurs almost simultaneously with fecundation of the egg, but the endosperm develops much more rapidly than does the embryo. The assumption that the endosperm is sporophytic is considered sound. The cytological data substantiate practically all the assumptions of cytological fact upon which recent experiments on endosperm heredity in maize have been based.

**The ancestry of maize**, J. H. Kempton (*Jour. Wash. Acad. Sci., 9 (1919), No. 1, pp. 3–11*).—This is mainly a discussion of a contribution by Weatherwax (E. S. R., 40, p. 728).

**Hybrid perennial sunflowers**, T. D. A. Cockerell (*Bot. Gaz., 67 (1919), No. 3, pp. 264–266*).—It is stated that near Boulder, Colo., where *Helianthus orgyalis* and *H. maximiliani* have been growing in close proximity for a number of years, a distinct form has appeared which is on the whole intermediate between these two, and which is supposed to be a hybrid resulting from their intercrossing. In order to bring out clearly the features of the new plant, each character is described in connection with a corresponding character of each supposed parent.

**Chondriosomes in plants**, C. J. Chamberlain (*Bot. Gaz., 67 (1919), No. 3, pp. 270, 271*).—This is a summary of results reported by investigators in the study of chondriosomes, chiefly in plants, the name (of the many mentioned which have been proposed for structures of this order) being favored on account of its noncommittal character. Attention is called to the bibliographies given in reports of studies on such bodies, that by Cavers (E. S. R., 33, p. 631) covering the literature of the subject up to 1914, and that by Mottier (E. S. R., 39, p. 332) bringing it up to 1918.

It is considered to have been established that chondriosomes are not artifacts, that they multiply by division, and that some of them give rise to plastids. Their part in heredity, however (if they have any), remains to be demonstrated.

**The physiological basis of morphological polarity in regeneration, I**, J. Loeb (*Jour. Gen. Physiol., 1 (1919), No. 3, pp. 337–362, figs. 18*).—Continuing previous reports (E. S. R., 41, p. 526) the author presents qualitative evidence regarding the inhibitory effect of a leaf upon shoot formation, discussion of more quantitative experiments being reserved for a later paper.

In *Bryophyllum calycinum*, growth of two apical leaves suppresses shoot formation in all dormant buds situated lower down the shoot, that of one apical leaf influencing the lower buds on that side (half) of the stem. Removal of one-half of the petiole of a leaf permits growth of lower buds in the corresponding quadrant of the stem. This inhibitory influence of the leaf diminishes or disappears when the mass of the leaf is reduced below a certain limit. The inhibitory influence of an apical leaf in case of horizontal suspended stems is greater when the leaf is on the upper side of the stem. The facts observed are considered to justify the suggestion that the inhibitory influence of the leaf upon shoot formations is due to inhibitory substances secreted by the leaf and carried with the sap toward the base of the stem. An apical leaf accelerates root formation in the basal part of the stem in proportion to the mass of the leaf.

It is concluded that this inhibition of shoot formation and the favoring of root formation are factors concerned in the determination of the polar character of regeneration.

**On certain shoot-bearing tumors of eucalypts and angophoras, and their modifying influence on the growth habit of the plants,** J. J. FLETCHER and C. T. MUSSON (*Proc. Linn. Soc. N. S. Wales, 43 (1918), pt. 1, pp. 191–233, pls. 24*).—This is an account of the presence and apparent relations of tumors discussed herein as found on eucalypts and angophoras, but mentioned also as occurring on about 10 species of other genera, observations regarding which cases are also to be published. The presence in some species of water-storing roots is also briefly discussed.

## FIELD CROPS.

**Irrigation of field crops in Nevada,** C. S. KNIGHT and G. HARDMAN (*Nevada Sta. Bul. 96 (1919), pp. 5–42, figs. 19*).—This bulletin comprises a discussion of irrigation practice in Nevada, the water supply and drainage areas of the State, factors affecting the duty of water, and experimental work with irrigated field crops, including alfalfa, wheat, potatoes, red clover, and sugar beets, already reported on from time to time (E. S. R., 41, p. 231).

Approximately 1.3 per cent of the area of the State was irrigated in 1918, of which about 145,000 acres was in alfalfa, 80,000 acres in wheat, and 15,000 acres in potatoes, these being the most important cultivated crops grown under irrigation. The Humboldt, Truckee, Carson, Walker, and Muddy are said to be the principal rivers supplying water for irrigation, and more than 50 per cent of the irrigated area received its water from the Humboldt River. The greater portion of the alfalfa and grain is irrigated by the border method of flooding, while the furrow method is used in the irrigation of potatoes and other similarly cultivated crops. The important factors affecting the duty of water in Nevada are designated as soil type, topography, hardpan near the surface, annual rainfall, and evaporation, the type of soil causing greater variation in the amount of water required under general field conditions than any other one factor.

The average results of early investigations with alfalfa, 1906–1911, show a total irrigation of 3.27 acre-ft. of water, producing a yield of 5.93 tons per acre. During the 5-year period 1914–1918, inclusive, practically no precipitation was received during the growing season that was sufficient to affect the moisture content of the soil. The irrigation water was measured into each plat through calibrated galvanized-iron pipes 2 in. in diameter, while check plats were used to prevent, as far as possible, any errors due to variation in soil. Alfalfa allowed to reach the wilting point before irrigation produced a relatively low yield per acre, but excellent returns were realized when irrigation was withheld until the plants turned dark green in color. The most economical use of water with alfalfa was accomplished with a total irrigation of 3.5 ft., applied when plants showed need of water by the dark-green color of the foliage, producing 5.59 tons per acre.

Soil-moisture determinations showed that 70 per cent of the 6-in. applications was retained in the first 4 ft. of soil. The use on this plat was equivalent during the period of irrigation to a delivery of water at the rate of 1 second-ft. for 85 acres, or 0.47 miner's in. per acre. The highest yield of alfalfa, 6.18 tons per acre, was obtained with an application of 81 in. of water when the crop was irrigated before plants showed need of water, but this was accompanied by the lowest yield per acre-ft., 1.03 tons. Soil-moisture determinations showed that only 25 per cent of the 12-in. application was retained in the first 4 ft. of

soil. In the irrigation of alfalfa the decrease in soil-moisture content at harvest was generally greatest with 9- and 12-in. applications, while the total amounts of water held in the soil were greatest with the last two stages of wilting.

In experiments with wheat made during 1914–1918, inclusive, 3- and 7-in. applications were given at two or more of the five stages of growth, including the 5-leaf, boot, bloom, milk, and dough stages. The highest yield was obtained with 28 in. of water in four applications, when an irrigation was omitted at the 5-leaf stage. The highest yield with three irrigations occurred with 21 in. of water when applications were omitted at the 5-leaf and dough stages. The average yields of wheat were considerably higher with 7-in. than with 3-in. applications. The yields were relatively low when irrigations were omitted at the boot and bloom stages, indicating that a very critical period occurs in the irrigation of wheat between the boot and milk stages. The highest yield with two irrigations was secured with 9-in. applications, one before and one after heading. High yields per acre were generally accompanied by the greatest decrease in soil-moisture content at harvest as compared with the soil-moisture content before the first irrigation.

In work with potatoes conducted during the period 1914–1917, inclusive, the highest yield was obtained with a total irrigation of 16.5 in. made in 3-in. applications, given when the plants showed a tendency to wilt.

Irrigation experiments with clover made in 1914 showed a gradual decrease in yield in the different plats with the same applications of water as the wilting stage advanced before water was applied.

The greatest yield of sugar beets during the two-year period 1914–15 was obtained with 18 in. of water made in 3-in. applications.

The results of these investigations are held to show that the most economical use of water was obtained with a total irrigation of 3.5 ft. in 6-in. applications for alfalfa and clover, 2.3 ft. in 7-in. application for wheat, and 1.5 ft. in 3-in. applications for potatoes and sugar beets. When alfalfa fields are used for fall pasture, usually an additional irrigation is required after the last crop of hay is harvested.

**[Report of work with field crops in Nova Scotia, 1918]** (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 27–39*).—Variety and fertilizer tests with oats and field tests with wheat, barley, mangels, turnips, and hay and pasture crops are briefly described.

**[Report of field crops work in Tortola]** (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Tortola, 1917–18, pp. 3, 4, 5, 7–9*).—This describes work with sugar cane, sweet potatoes, corn, cassava, beans, and cotton on the island for the year ended March 31, 1918.

**Guide to experiments for 1919 [in Northumberland County, England]**, D. A. Gilchrist (*County Northumb: Ed. Com. Bul. 29 (1919), pp. 4–18, pl. 1*).—This describes the continuation of rotation, fertilizer, and variety tests with field crops along the same general lines as previously noted (E. S. R., 40, p. 624).

**[Report of seed testing and experimental work at Oerlikon, Zurich]**, A. Volkart et al. (*Landw. Jahrb. Schweiz, 33 (1919), No. 1, pp. 38–77*).—This describes the continuation for 1916–17 and 1917–18 of work along the same general lines as that previously noted (E. S. R., 38, p. 538).

**Food and fodder plants**, J. H. Holland (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 1–2 (1919), pp. 1–84*).—The important food and fodder plants occurring in the Leguminosæ, Gramineæ, Cruciferæ, and Rosaceæ are enumerated, together with additional important products occurring in other families. The chief countries of production, the imports into Great Britain, the approximate

production of the principal crops in the United Kingdom, brief notes on their utilization, and other information deemed of interest relative to the various crops are presented.

Rotations and crop distribution, F. PARISOT (*Rotations et Assolements. Paris: Libr. Larousse, [1911], pp. 136, figs. 2*).—A practical treatise on the subject.

The effect of drying on the germination of cereals, R. G. STAPLEDON and M. ADAMS (*Jour. Bd. Agr. [London], 26 (1919), No. 4, pp. 364–381*).—The authors describe observations made at the English Seed Testing Station on the effect upon the germination of samples of wheat, barley, rye, and oats of drying the seed for three days at 40° C. (104° F.), and of holding it without drying for three weeks as compared with tests made upon the samples as received. Observations were also made on the effect of drying upon poorly developed and sprouted grain. The results secured are believed to have a significant bearing, both on routine seed testing and on the problem of "conditioning" grain.

Some risk is said to be involved in sowing these cereals, even when in a sound condition, early in the fall and immediately after thrashing. Kiln-drying with subsequent air-drying is recommended for wheat, barley, and rye under such circumstances, while in the case of oats air-drying for two or three weeks is deemed best. It is also stated that tests made after drying or holding the seed are much more representative of the commercial value of the sample than tests made when the sample is received.

A new cultural process for cereals, C. ROSSI (*Nuovo Processo per la Coltivazione dei Cereali. Milan: Ulrico Hoepli [1917], pp. 8, pls. 7, figs. 5; abs. in Physiol. Abs., 4 (1919), No. 5, p. 244*).—Immersing the seed of cereal crops in a 3 per cent solution of ammonium nitrate for from 12 to 14 hours is said to have increased the yield of grain 25 per cent and that of straw 30 per cent.

Breeding small grains in Minnesota (*Minnesota Sta. Bul. 182 (1919), pp. 5–56, figs. 14*).—This bulletin comprises two parts, as follows:

Part I. *Technique and results with wheat and oats*, by H. K. Hayes and R. J. Garber (pp. 5–44).—The methods employed in plant breeding work at the station are described, and the results secured with winter and spring wheat and oats outlined. The work may be summarized as follows:

Cereal breeding includes introductions of new sorts, selections, and crosses followed by selection. New introductions are deemed essential if the breeder is to have the best material as a basis for study. Introductions that appear promising in preliminary row tests are used as a basis of selection, while selections from commercial sorts are also made. The head selection method is used, from 50 to 200 heads being selected the first year. Nonpromising sorts are eliminated in the field and the second year three systematically distributed plats of a single 18-foot row each are grown for each selection, one foot being removed from each end before harvest. The third year tests are made in three plats of three 18-foot rows each, the central row only of each plat being used for the yield test. Border rows are grown to obtain more accurate data on lodging and to overcome competition between near-by sorts.

Crosses are made between parental sorts selected because of some particular characters. No selections are made in the $F_1$ of a cross, as all plants are of the same genotype. Noncrosses are immediately discarded. A large plat is grown in the $F_2$, individual plants selected, and the seed of each plant sown in a separate plat in the $F_3$. Selection by this method is continued until many homozygous forms are obtained. As homozygous sorts appear they are placed in the rod-row test and handled thereafter the same as selections. All row tests are

examined yearly for possible genetic impurities, and reselection practiced if the type is segregating. Mechanical mixtures are rogued out. A bulk plat of a cross is grown for several years, the cross becoming homozygous automatically according to the formula $\left(\frac{2n-1}{2n}\right)^m$, in which $n$ is the number of generations elapsing since the cross, and $m$ the number of allelomorphic pairs by which the parent sorts differ. After several years individual selection is practiced.

Rod-row plats of a standard sort are grown every third to fifth plat and the yelds determined. The probable error of the average of three plats systematically distributed as determined by the checks is multiplied by three, and when subtracted from the higher yielding sort a somewhat arbitrary figure is obtained below which it is considered safe to discard all sorts for the season in question without eliminating a high yielding strain. A similar method is used in determining higher yielding sorts after a three-year test. Promising sorts are also tested in rod rows in cooperation with several of the substations. After a three-year test in rod rows, sorts of promise are placed in the plat varietal test conducted by the section of farm crops. Pedigreed sorts produced at this or other stations are ultimately distributed to the farmers. The investigational staff of the division acts as a board to determine, on the basis of performance, which sorts to distribute.

New introductions of winter wheat obtained from the Office of Cereal Investigations, U. S. Department of Agriculture, proved less hardy than selections and crosses which were made at this station many years ago. Some selections and crosses stand up much better than others, including both subcorneous and substarchy types. Odessa, a late-maturing sort, was crossed with Turkey, which matures somewhat earlier, homozygous forms having been produced which range in maturity from the early to the late parents. Several of these crosses proved as hardy as the Odessa parent, or slightly hardier, and gave much higher yields, while some of them were nonhardy. Other crosses were made, none of which gave as hardy wheat as when Odessa was used as a parent, indicating the value of using as a parent a type which excels for the character desired. Pure lines which excelled in hardiness include a Turkey selection, I–03–120; Big Frame I–06–6; and I–03–229, a bearded, smooth, red-chaffed form with subcorneous kernels selected from an introduction from Padui, Russia.

Cooperative rust investigations conducted with the hope of producing a rust resistant bread wheat of milling quality limited other agronomic breeding studies with spring wheat, but recent pathological investigations (E. S. R., 40, p. 642) in which many biologic forms have been found are believed to have rendered questionable the value of further rust-breeding studies. Row tests of bread wheat sorts indicated that Marquis is a very desirable variety for Minnesota conditions. Several crosses made in 1908 between Turkey Winter and Wellman Fife are deemed better than Haynes Bluestem (Minnesota 169), although none appeared to be of more value than Marquis. Based on a comparison with D–1 and D–4, North Dakota selections; Acme, a South Dakota pedigreed sort; and other Arnautka and Kubanka pedigreed varieties, Mindum, a selection from the Arnautka (durum) group, is said to have given evidence of being a valuable sort for Minnesota.

Oats breeding consisted of a study of the value of selection, it being found comparatively easy to produce a higher yielding sort by selection from a commercial variety. Results with Sixty Day oats are regarded as especially striking, although only a single year's test in rod rows is available. One pure line,

1-17-72, which stood up better than commercial Sixty Day and also excelled it in yield, seems to be of much promise as compared with Iowa 103. On the basis of the three-year yield test, pure lines of several varieties gave evidence of promise. From the breeder's standpoint it seems that the isolation of a higher yielding strain is more important than the variety. Selections of the following varieties are deemed worthy of further test: Minota (a Minnesota selection), Garton 473, Garton 784, Scottish Chief, Irish Victor, Silvermine, Lincoln, and Kherson. It is stated that all the plant breeder can hope to accomplish in three or four years is to determine the sorts which deserve further test, the final trial being for the purpose of determining the adaptability of the sorts to special conditions and localities. The pairing method for the determination of the probable error gave about the same result for the 1918 oat test as the use of check plats systematically distributed and grown every third to fifth plat.

Part II. *Investigations in barley breeding*, by H. V. Harlan and H. K. Hayes (pp. 45–56). This describes work conducted in cooperation with the Office of Cereal Investigations, the results of which may be summarized as follows:

Some head selections of Manchuria barleys proved to be low yielders each year, while others gave high yields each year. Nearly as wide variations in yield were found when comparing head selections within a variety as were obtained by comparing different varieties. Several smooth-awned sorts were compared with standard Minnesota types, the results indicating that smooth-awned barleys of high yielding ability can be obtained. A cross between Manchuria and a low-yielding stiff-strawed sort, known as South African, has given two selections having yielding ability and stiffer straw than the Manchuria parent. Results reported are said to show the necessity of testing a new production in various localities of the State before recommending its general introduction.

**Leguminous crops on the prairies [of Canada]**, T. J. Harrison and J. McCaig (*Agr. Gaz. Canada, 6 (1919), No. 6, pp. 552–557, figs. 5*).—Brief notes are presented on the adaptation and production of alfalfa and red, alsike, white Dutch, and sweet clovers in Manitoba, and alfalfa and red, alsike, and sweet clovers in Alberta.

**Paper-making materials of the Philippines**, J. F. Boomer (*U. S. Dept. Com., Com. Rpts., No. 178 (1919), pp. 632–649*).—Based on data gathered by G. F. Richmond, information is presented relative to fiber and other raw materials suitable for the manufacture of paper pulp and of raw materials required for the production of chemicals employed in paper-pulp making found in the Philippine Islands. The paper-making materials mentioned include bamboo, abaca waste, cogon (*Imperata exaltata*), talthib (*Saccharum spontaneum*), plantains (*Musa paradisiaca*), bananas, maguey (*Agave cantula*), and miscellaneous minor sources of paper stock. Raw materials for the manufacture of paper-making chemicals include lime, clays, and sulphur.

**Silage crops other than corn [in Canada]**, J. M. Trueman, R. Summerby, H. Barton, Brother Athanase, W. Toole, J. H. Ellis, J. Bracken, J. McCaig, and P. A. Boving (*Agr. Gaz. Canada, 6 (1919), No. 6, pp. 538–544*).—Information is presented on the utilization of various crops other than corn for silage in different parts of Canada, including notes on alfalfa, rye, clover, soy beans, Sudan grass, millet, rape, buckwheat, sunflowers, and mixtures of cereals, peas and vetch.

**Alfalfa seed growing and the weather, in Utah**, J. C. Alter (*U. S. Mo. Weather Rev., 47 (1919), No. 5, pp. 330–332, figs. 3*).—The relation of temperature and rainfall to alfalfa seed production in Utah is discussed.

It is stated that the crop requires sufficient moisture during its early growth to produce vigorous plants followed by rather dry weather during the blooming

period, and that the best results are secured with spring temperatures averaging from 3 to 5° F. a day above the normal, and summer temperatures from 2 to 4° a day below normal. A temperature of from 26 to 28° in the foliage is said to result in serious damage to partly ripe and unripe seed burrs. The seed is usually ready to harvest from one to two weeks before the average date for the first killing frost, but protection of the seed crop from early frosts by means of smudging is deemed sufficiently promising to merit careful consideration, especially where the practice can be made a community affair.

[Lodging in barley], C. KRAUS (*Jour. Landw., 66 (1918), No. 1, pp. 53–70*).—Experimental work is described, from which it is concluded that potash aids in the production of stiff straw in barley, although inherent varietal characteristics with regard to lodging and various other cultural factors are also believed to play an important rôle in this respect.

Soil and fertilizer conditions which determine the tendency of the beet to produce seed the first year, O. MUNERATI and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 51 (1918), No. 1–2, pp. 24–40, pls. 2, figs. 2; abs. in Chem. Abs., 13 (1919), No. 13, p. 1511*).—Supplementing work previously noted (E. S. R., 31, p. 330), the authors describe observations on the effect upon seed production the first year of growing beets on different types of soil and with various fertilizer treatments. The number of plants producing seed the first year ranged from 1 to 2 per cent of those plants grown on sandy soil without fertilizers to 55 per cent of those grown on a loam soil receiving applications of manure and chemical fertilizers.

Chenopodium quinoa in the Netherlands, F. F. BRUYNING (*Cultura, 31 (1919), No. 369, pp. 182–190*).—This describes cultural tests with *C. quinoa* conducted during 1918.

Inheritance of spotted aleurone color in hybrids of Chinese maize, J. H. KEMPTON (*Genetics, 4 (1919), No. 3, pp. 261–274, figs. 3*).—This paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, describes six crosses made during 1913 between a colored Algerian pop corn and a Chinese white waxy corn previously described (E. S. R., 22, p. 443) in a study of the inheritance of a spotted type of color distribution. A large number of hand-pollinated ears bearing seeds representing the $F_2$ generation were secured in 1914, the progeny of all but one of the six crosses producing ears with some spotted seeds. The inheritance of these spotted seeds is analyzed and conclusions reached as follows:

In the seeds of certain ears borne on white-seeded plants pollinated from colored plants the aleurone color was distributed in numerous small spots, while the reciprocal crosses were self-colored. Spotting is assumed to be due to a dominant spotting factor, *S*, which functions as a partial inhibitor. The results of these observations are held to indicate that factor *S* can operate only when factor *R* is heterozygous, and also that it is not present in the female gamete but is introduced into the zygote by the male gamete. Since the male gamete contributes one nucleus while the female gamete contributes two, it is thought that the difference between reciprocals may be ascribed to the fact that the female parent contributes twice as much chromatin material as the male parent. It is deemed evident, therefore, that a single nucleus does not contain a sufficient amount of factor *R* to produce a self-colored seed in the presence of the dilution factor *S*. The percentage of spotted seeds and their appearance only on those self-pollinated ears which have no correlation between aleurone color and endosperm texture has led to the conclusion that there is a coupling or linkage between factor *R* and factor *S*. The gametic ratio in these hybrids approximated a series of *7RS*: *1Rs*: *1rS*: *7rs*, said to

be equivalent to the location of the two factors on the same chromosome, 12.5 units apart.

Cotton variety tests, 1918, A. C. LEWIS and C. A. MCLENDON (*Ga. Bd. Ent. Bul. 52 (1919), pp. 40, figs. 2*).—This describes the continuation of work previously noted (E. S. R., 40, p. 237).

[Cotton production in French North Africa], V. CAYLA (*Ann. Sci. Agron., 4. ser., 8 (1919), Nos. 1–3, pp. 1–46; 4–6, pp. 145–203, pl. 1*).—This comprises a rather detailed account of the status of the industry in Egypt, Tunis, Algeria, and Morocco during 1917. A bibliography containing 53 titles is appended.

Cotton culture [in Rhodesia], H. W. TAYLOR (*Rhodesia Agr. Jour., 16 (1919), No. 3, pp. 197–201, pls. 2*).—The possibilities of the crop in Southern Rhodesia are indicated.

Cotton and the cellulose industry, I–II, J. MEUNIER (*Rev. Sci. [Paris], 57 (1919), Nos. 5, pp. 135–142, figs. 16; 6, pp. 168–177, fig. 1*).—This comprises a general discussion of the utilization of cotton in the industry.

Utilization of delint for paper making, O. KRESS and S. D. WELLS (*Cotton Oil Press, 3 (1919), No. 3, pp. 27–36, figs. 18*).—In this paper, a contribution from the Forest Products Laboratory of the U. S. Department of Agriculture located at Madison, Wis., the authors describe investigations in which an effort was made to ascertain the suitability of second cut cotton linters, cotton shavings, and hull fiber for paper manufacture. It is concluded that a high-grade paper stock can be produced from these materials.

Flax as a fiber plant in British East Africa, H. SIMPSON (*Dept. Agr. Nairobi [Brit. East Africa] Bul. 3 (1919), pp. 10, pls. 4*).—This comprises a brief description of flax production and of the preparation of the fiber for market.

Oil from British-grown linseed (*Jour. Bd. Agr. [London], 26 (1919), No. 4, pp. 420–428*).—This comprises a review of papers prepared by J. V. Eyre and R. S. Morrell on the agricultural possibilities of flax production for oil in England and on the commercial value of the oil.

Prospects of hop growing in South Africa, G. SHAW-SCOTT (*So. African Jour. Indus., 2 (1919), No. 6, pp. 519–530, figs. 2*).—The possibilities of hop growing in South Africa are discussed.

The indigo of Nigeria and its value as a dye (*Bul. Imp. Inst. [So. Kensington], 17 (1919), No. 1, pp. 31–37*).—*Lonchocarpus cyanescens*, described as indigenous to West Africa, is said to yield the same blue dye as *Indigofera* spp. Native methods of extracting the dye are briefly noted and the results of analyses given of several samples of indigo from *L. cyanescens* examined at the Imperial Institute. The yield of indigo was found to be considerably less than that secured from Indigofera.

[Reseeding frost injured oat fields on moor soils], H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 33 (1919), No. 4, pp. 360–364, fig. 1*).—The results are reported of experiments conducted to determine the relative advantages of reseeding and not reseeding oat fields severely injured by late spring frosts.

In the spring of 1918, when late heavy frosts had largely destroyed the parts above ground of growing oat plants, one-half of a plat laid out in one of the frost-damaged fields was reseeded June 8, while on the other half the frosted crop was allowed to remain. The reseeded half produced 59 per cent more straw and 103 per cent more grain than were secured fom the other half of the plat. It was found also that the crop when cut from the reseeded half contained only 2 per cent of weed plants as compared with 45 per cent for the half with the frost-damaged crop.

Potato experiments, 1917 and 1918, H. O. WERNER (*North Dakota Sta. Bul. 129 (1919), pp. 3–22, figs. 3*).—Variety tests conducted at several points in the

State and cultural experiments made at Fargo are described. The results of the variety tests are held to indicate that Irish Cobbler potatoes might well be grown to a greater extent, while Burbank is deemed unsuited to North Dakota conditions.

Experiments with different sized seed pieces indicated that the best average results are secured from 1.5 oz. seed pieces. The selection of seed potatoes from the bin is regarded as much less satisfactory than hill selection. Little difference was observed in the comparative value of buds from various parts of the tuber, or between seed pieces having 1, 2, or 4 eyes. In a comparison of different methods of cutting seed potatoes, the maximum yield, 275.7 bu. per acre, was secured from hand cutting with the cuts made just above the bud and slanting toward the stem end of the tuber. The rapidity of emergence of shoots showed little difference for seed pieces of different sizes, for pieces from various parts of the tuber, for pieces with 1, 2, or 4 eyes or for seed cut in different ways, except that tubers quartered lengthwise were much slower than the others.

In 1918 the highest yield, 259.1 bu. per acre, was secured from the earliest planting (May 4). In spacing experiments made during 1918 the net yield decreased as the area per plant increased. The total yields ranged from 195.7 bu. per acre for a planting distance of 2.5 ft. between rows with 24 in. between plants to 373.4 bu. for a distance of 2 ft. between rows and 6 in. between plants. Seed treatment and spraying with Bordeaux mixture resulted in increased yields on both manured and unmanured plats, this being more marked on the former than on the latter. Hilling potatoes reduced the yield as compared with level cultivation.

In a study of the time and rate of tuber growth in Green Mountain potatoes during 1917, the total yield secured August 10 was 121.6 bu. per acre as compared with 220 bu. on September 11 when the vines were killed by frost. The daily increase during the first 10-day interval was found to be 2.34 bu. per acre, and during the last 3-day interval 5.27 bu.

**The prickly pear in Australia**, W. B. Alexander (*Aust. Inst. Sci. and Indus. Bul. 12 (1919), pp. 48, pl. 1, figs. 16*).—This comprises a somewhat detailed account of the introduction and spread of the prickly pear, particularly the so-called pest pear (*Opuntia inermis*) in Queensland and New South Wales, together with a discussion of its utilization and of methods of eradication. The use of arsenicals either as a spray or as a gas is said to have given the most promising results.

**Probable material for the study of the experimental evolution of Oryza sativa, var. plena**, R. K. Bhide (*Agr. Jour. India, 14 (1919), No. 3, pp. 494–499, pls. 2*).—Variations in different varieties of rice grown at Alibag (India) tending toward the so-called double grain rice or *O. sativa*, var. *plena* are described. The possibility of developing the double grain type from an ordinary variety without crossing is indicated.

**Propagating sorghum by cuttings**, A. Piédallu (*Bul. Soc. Natl. Acclim. France, 66 (1919), No. 1, pp. 15–17*).—The author states that sorghum can be readily propagated by means of cuttings of the stem and that desirable varieties can thus be maintained in a pure state.

**The effect of soy bean germination upon the growth of its nodule-forming bacteria**, A. R. C. Haas and E. B. Fred (*Soil Sci., 7 (1919), No. 3, pp. 237–243, pl. 1*).—In this paper, a contribution from the Wisconsin Experiment Station, the authors describe investigations in which a study was made of the toxic effect of the germination of soy bean seeds upon the growth of nodule bacteria inoculated upon the seed coat. The studies also involved observations on various methods of sterilizing soy bean seeds.

The results secured are held to indicate that the germination of soy bean seed favors the growth of the nodule bacteria. When bacteria-free seeds were obtained directly from the pods and inoculated with soy bean bacteria, no toxic action of substances excreted from the germinating seed upon the growth of the nodule bacteria was observed. It was also found that the use of mercuric chlorid as a sterlizing agent in studies of this sort is not permissible.

**Louisiana seedling canes**, W. G. TAGGART (*Sugar [New York], 21 (1919), No. 8, pp. 426–429, 439*).—This describes the continuation of work previously noted (E. S. R., 26, p. 235) in an effort to develop varieties of sugar cane in Lousiana.

It is stated that since 1911, 164 lots of cane seed have been received from which 887 varieties have been tested in the field. Only one variety, L 974, surpassed L 511, the leading variety up to 1911, in the sucrose content of the juice. L 974 produced 14.05 per cent sucrose in the fall of 1918, as compared with 13.86 per cent for plant cane and 15.29 per cent for stubble of L 511.

**The effect of salinity on the growth and composition of sugar cane varieties**, K. KRISHNAMURTI ROW (*Agr. Jour. India, 14 (1919), No. 3, pp. 476–493, pls. 8, fig. 1*).—The author describes observations made at the Coimbatore (India) cane breeding station during the period of 1914–1918, inclusive, on the effect of a saline condition of the soil upon different varieties of sugar cane.

It is stated that soft, thick, juicy varieties failed to develop at all on saline land, while thin, hard, less juicy sorts made a fair growth. Sodium chlorid was found to be the limiting factor involved. Irrigation with saline water resulted in impure juice containing large amounts of chlorin and potash.

A method for the direct determination of chlorin in the juice by means of lime water and alumina cream is described and is said to give satisfactory results for field work. Large quantities of chlorin in the juice lowered the sucrose and glucose contents as well as the purity of the juice.

**[Proceedings of the Hawaiian Sugar Planters' Association]** (*Proc. Hawaii. Sugar Planters' Assoc., 38 (1918), pp. 346, pls. 3, figs. 20*).—This comprises a report of the thirty-eighth annual meeting of the association held at Honolulu during December, 1918. Committee reports dealing with the following subjects were presented and discussed: Forestry; cultivation, fertilization, and irrigation on irrigated plantations; cutting, loading, and general transportation; manufacturing machinery; labor saving devices; the sugar-cane experiement station; sugar manufacture and utilization of by-products; agricultural machinery and implements; and cultivation and fertilization on unirrigated plantations.

**Hereditary flower anomalies in tobacco**, G. KLEBS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 17 (1916). No. 1–2, pp. 53–119, pl. 1, figs. 16; abs. in Genetica [The Hague], 1 (1919), No. 2, p. 187*).—The author describes the appearance of a flower anomaly in *Nicotiana tabacum* which he designates *lacerata*, and traces its behavior through various crosses. The *lacerata* form is said to agree with the original stock in all vegetative characters, while the flowers are abnormal, having strongly petaloid calyx somewhat thickened at the base and in many cases exhibiting a torn or divided corolla.

A bibliography of 44 titles is appended.

**An improved strain of Wisconsin tobacco: Connecticut Havana No. 38.** J. JOHNSON (*Jour. Heredity, 10 (1919), No. 6, pp. 281–288, figs. 3*).—In this paper, a contribution from the Wisconsin Experiment Station, the author traces the development of a commercial type of tobacco.

A cross made in 1909 of two strains of tobacco designated as 26 and 27, respectively, and said to be mutants from common Connecticut Havana, gave rise to a strain (No. 38) said to possess considerable commercial value. The

chief advantages claimed for No. 38 are the quite erect leaves of uniform size from top to bottom of the plant, being somewhat broader in proportion to their length than ordinary Havana leaves; the presence of one or two leaves more to the plant, on the average, than Havana, together with a greater average size of leaf; and an estimated yield of from 7 to 10 per cent more than ordinary Havana. The quality is said to be equal to that of Connecticut Havana. It is also estimated that approximately one-fourth of the total acreage devoted to tobacco in Wisconsin will be grown to this type in 1919.

**The Canadian water weed as a fodder plant** (*Jour. Bd. Agr. [London], 26 (1919), No. 3, pp. 321, 322*).—The utilization of Canadian water weed or water thyme (*Elodea canadensis*) for silage is briefly discussed.

**Harmful effects upon germination of the formalin treatment for seed,** L. Kiessling (*Jour. Landw., 66 (1918), No. 1, pp. 7–51*).—The author discusses in considerable detail the effect upon germination of dipping winter and spring wheat and oats in formalin solutions of different strengths and for varying lengths of time, together with observations on the effect of the treatment upon injured grain and upon moist stored grain.

**[Proceedings of the American Seed Trade Association]** (*Proc. Amer. Seed Trade Assoc., 36 (1918), pp. 126, pl. 1*).—This comprises an account of the thirty-sixth annual convention of the association held in Chicago during June, 1918. In addition to committee reports and other business the following papers were presented and discussed: Seed Reporting as a Public Service, by W. A. Wheeler; Persistent Varietal Character in Garden Vegetables, by W. W. Tracy; The Home Garden as a Means of Increasing the Food Supply, by W. R. Beattie; Community Building in War Times, by A. K. Lovrien; and Some Immediate Responsibilities of the Seed Trade, by R. A. Oakley.

**Seed growing in Great Britain** (*Jour. Bd. Agr. [London], 26 (1919), No. 3, pp. 318–321*).—This comprises a brief account of the industry in Great Britain with special reference to vegetable seed production.

**The control of weeds in field crops,** E. Korsmo (*Tidsskr. Norske Landbr., 26 (1919), No. 5, pp. 193–227, figs. 20*).—This article discusses combating weeds in field crops by means of seed treatment, cultivation, spraying, and fallowing, and reports the results of a number of experiments along some of these lines. Directions are given for the preparation of the solutions used in seed treatment and spraying.

In 1917, the results of experiments with wheat and rye showed the following average increase in grain yield under the different methods of weed control: Harrowing once before the plants appeared above ground 18 per cent, spraying with iron sulphate solution 24 per cent, dusting with cyanamid 24.25 per cent, spraying with sulphuric acid solution 28 per cent, and hand weeding 27 per cent.

Experiments were conducted for four years with potatoes for the comparison of clean, ordinary, and no culture as affecting the percentage production of large and small tubers as well as the starch content. Clean culture by means of cultivation and weeding gave 83.5 per cent of large tubers, the removal of the weeds without cultivation gave 81.2 per cent, ordinary culture 78.3 per cent, and no cultivation or weeding during the growing period 39.1 per cent. The starch content ranged from 15.8 per cent in the tubers grown under clean culture with cultivation and seeding to 16.5 per cent in those grown without any cultivation or weeding.

A similar series of experiments was carried on with turnips, kohl-rabi, and carrots. Clean culture by means of cultivation and weeding gave on the average 29 per cent more turnips, 26 per cent more kohl-rabi, and 54 per cent more car-

rots than were secured with ordinary cultivation. Keeping these crops clean by hand weeding as compared with no cultural treatment increased the yield of turnips 153 per cent, of kohl-rabi 131 per cent, and of carrots 193 per cent. In all these tests also higher yields of foliage were recorded where the crops were kept free from weeds.

The results of tests with cultivated and uncultivated fallow are reported as largely in favor of cultivation, either on the level or in ridges. Ridging the fallow together with deep plowing in 1917 resulted in 1918 in an increase of 134.5 per cent of grain and of 80 per cent of potatoes as compared with the yields secured on the uncultivated fallow. On the level or flat cultivated fallow the corresponding increases in yield were 102.3 and 85 per cent. The proportion of straw in the grain crops was decreased on both types of cultivated fallow.

## HORTICULTURE.

**Report of the professor of horticulture,** P. J. SHAW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 75–100, pl. 1*).—Notes on cultural and varietal experiments with fruits and vegetables conducted at the Nova Scotia Agricultural College Farm.

**A comparative study of the development of lettuce in the sunshine and in the shade,** L. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 13, pp. 694–697*).—During the years 1917 and 1918 the author grew lettuce plants of the same kind in similar soils, one plat being in the open light and the other in the shade.

Observations made on the plants of both plats showed that the attenuated light caused the orbicular leaves of the rosette to become elongated and, at the same time, tended to prevent heading. This effect increased as the light was reduced. In other respects, when the optimum exists for the various other development factors, the lettuce behaves like other plants submitted to attenuated light. There is a direct correlation between the respective developments of the vegetative and reproductive parts. If the water supply is reduced the inhibitory action of the light on growth under semishade is more or less quickly compensated, then destroyed. The height of the plant is reduced at the same time that the sexual reproductive faculties rapidly weaken. Therefore, within the limits of optimum illumination, there must be a complete harmony of other development factors, especially water supply, to assure the maximum of development.

**Acclimatization trials of Lima beans (Phaseolus lunatus),** E. MATHIEU (*Garden's Bul. Straits Settlements, 2 (1919), No. 4, pp. 121–129*).—Notes are given on tests conducted with several American varieties of Lima beans in the Straits Settlements during the years 1918–19. Two subsequent generations of seed raised in the Straits Settlements from the imported seed were also tested. Results in general indicate that the bean has not suffered degeneration through change of climate and habitat, and it may now be considered as acclimatized.

**The influence of soil on the saccharine content of cider apples,** A. TRUELLE (*Ann. Sci. Agron., 4. ser., 8 (1919), No. 4–6, pp. 107–116*).—Analyses collected during several years are given of cider apples grown on plateau, hillside, and valley soils. A study of these data as a whole indicates that soil situation has only a relatively small influence on the sugar content of the apple.

**A further note on the genetics of Fragaria,** C. W. RICHARDSON (*Jour. Genetics, 7 (1918), No. 3, pp. 167–170*).—In continuation of a previous note (E. S. R., 30, p. 740), notes are given on crossing experiments with strawberries, which were started in 1910. In addition to a discussion of character

inheritance the author presents some notes on the technique of crossing, based on his own experiences.

Thus far the author has failed to find a case of a female flowering plant becoming male or hermaphrodite; whereas it is almost impossible to say that a given apparently male plant will not set an occasional well-developed fruit or an occasional seed. The crossing of species has not resulted in any fruit markedly larger than either of its original parents. No free fruiting plants have been obtained from crosses made with *vesca*×*daltoniana*, garden varieties, and *chiloensis*. The author is inclined to believe that *vesca* has nothing to do with the present garden varieties.

**Berry fruits and berry wines,** M. LEBL (*Beerenobst und Beerenwein. Berlin: Paul Parey, 1915, 3. rev. ed., pp. VI+114, figs. 39*).—A treatise, revised by G. A. Langer, on the culture of bush and cane fruits, strawberries, and rhubarb, including directions for making wine and fruit juices.

**The limits in hybridization of Vitis rotundifolia with related species and genera.—First report,** L. R. DETJEN (*North Carolina Sta. Tech. Bul. 17 (1919), pp. 5–26, figs. 3*).—A brief review of the work of earlier grape breeders, with special reference to the hybridization of *V. rotundifolia*, and an account of work done along this line at the station from 1912–1918, inclusive. A list of cited literature is gven.

The work thus far conducted at the station shows that *V. rotundifolia* will hybridize with *V. munsoniana* and some species of Euvitis, namely *V. vinifera*, *V. bourquiniana*, *V. labrusca*, *V. cordifolia*, and *V. æstivalis*, also with the varieties Winchell, Concord, and others. The limits of hybridization have not been established, but the results indicate what may be expected in hybridizing *rotundifolia* with the above related species and genera.

*Rotundifolia* will also hybridize with its own $F_1$ hybrids with other species of Vitis. When used as the male parent it will hybridize quite readily with some species of Euvitis, but when used as the female parent it will hybridize only rarely. Certain combinations are more congenial for hybridization than others. *Rotundifolia* failed to hybridize either way with such related genera as *Parthenocissus quinquefolia*, *P. tricuspidata*, or *Ampelopsis heretophylla* var. *elegans*.

Other species are to be reported on later as time and material permits, but the author considers that it is doubtful whether *rotundifolia* will hybridize with all species of Vitis.

**Some $F_1$ hybrids of Vitis rotundifolia with related species and genera,** L. R. DETJEN (*North Carolina Sta. Tech. Bul. 18 (1919), pp. 51, figs. 33*).—During the course of the above-noted study numerous hybrid plants of different parentage have been produced. This bulletin gives a list of nine parental combinations effected and describes and illustrates the characters of several hybrid vines. A general survey is then given of the hybrid characters in $F_1$, and the status of so-called "false hybrids" is discussed.

A careful study of hybrids derived from *V. rotundifolia* and such other species as *V. vinifera*, *V. labrusca*, *V. bourquiniana*, *V. cordifolia*, and the hybrid variety Winchell indicates that they are generally more or less intermediate in character. The Rotundifolia group when hybridized with Euvitis species is less prepotent as to external characters than has generally been supposed. Such hybrids are almost sterile, and this sterility is due mainly to hybridization, especially in perfect hermaphrodite forms. In the imperfect hermaphoditic and staminate vines, sterility is due to the double phenomenon of sex or intersexualism and hybridization.

A number of so-called "false hybrids," originated by T. V. Munson, and described in Foundations of American Grape Culture (E. S. R., 22, p. 42) were grown in the station collection under constant observation for nine years. It is concluded that these "false hybrids" are in reality not hybrids, but straight seedlings of the supposedly dominant parent species, *V. rotundifolia* and *V. munsoniana*.

**The hybrid direct bearers for the reconstitution of vineyards**, E. ROUART and L. RIVES (*Les Hybrides Producteurs Directs pour la Reconstitution du Vignoble. Paris: Libr. Agr. Maison Rustique, 1918, pp. 132, figs. 17*).—The authors briefly review the work of viticultural investigations in hybridizing American and European grapes, with the view of producing varieties resistant to phylloxera, chlorosis, mildew, etc., discuss the importance of this work to the grape industry in France and give descriptive notes on hybrid direct bearers produced by various breeders. The concluding chapters contain details relative to the culture of these hybrids, notes on wines produced from them, and a classification by color and earliness of the hybrids studied.

**The acidity of the sap in some grapevines and their resistance to disease**, M. DEGLI ATTI (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 14 (1916), pp. 16*).—An analytic study of the sugar and acid content of several European and American varieties of grapevines leads the author to conclude that there is a direct relation between the disease resistance of vines and the acidity of their sap.

Late maturing vines, which were more subject to parasitic attack than early maturing vines, have a relatively low-acid content in the sap, a high sugar content, and organs rich in oxidases. Earlier maturing vines, on the other hand, were either immune or less subject to parasitic attack. They had a relatively high acid and low-sugar content and organs poor in oxidases. The early maturing class included certain early European varieties, the American varieties, and phylloxera infested vines. Reduced root activity, due to phylloxera attack, tends to precocious maturity and a high acid content.

**The growing, pruning, and care of grapevines in cold climates, on walls, espaliers, and in grape houses**, R. BETTEN (*Erziehung Schnitt und Pflege des Weinstocks im Kälteren Klima an Wänden, Spalieren, und in Rebhäusern. Frankfort on the Oder: Trowitsch & Son, 1919, 4. ed., rev. and enl., pp. VIII+172, figs. 152*).—A practicable treatise on grape culture, both outdoors and under glass, with special reference to German conditions.

**[Horticultural investigations in the Gold Coast, 1916 and 1917]**, W. S. D. TUDHOPE ET AL. (*Govt. Gold Coast, Rpt. Agr. Dept., 1916, pp. 3, 4, 5, 14, 16–19, 23, 24, 25, 26, 28, 30, 31, 35, 36, 37, 38, 39, 42, 43, 44, 48, 49, 50, 51, 52, 55, 56; 1917, pp. 3, 4, 5, 7, 10, 11, 13, 16–18, 23, 24, 25, 28, 29, 31, 32, 38, 39, 42, 43, 44, 45, 48, 49, 54, 55, 56, 57, 59, 60, 61*).—Progress reports on cultural experiments with cocoa, cola, coconut, coffee, and other economic plants in the various agricultural stations and substations in the Government of the Gold Coast.

**The anay, a new edible-fruited relative of the avocado**, S. F. BLAKE (*Jour. Wash. Acad. Sci., 9 (1919), No. 16, pp. 457–462, fig. 1*).—A general account, together with a botanical description and illustration, is given of the anay, an avocado-like fruit collected by W. Popenoe in Guatemala.

The author's study of the branchlets, leaves, and floral parts of this fruit shows it to belong to the genus Hufelandia, and it is here described as *H. anay* n. sp. The fruit of the anay resembles certain avocados in its ellipsoid-pyriform shape and general appearance. The skin is smooth, glossy, purplish black in color, and is very thin and membranous, adhering closely to the firm, oily, rather scanty flesh. The flesh has a rich, bland flavor like that of a very

good avocado, but is faintly sweetish. The anay grows in moist regions of Guatemala at an elevation of only 300 to 365 meters (984 to 1,197 ft.), hence Popenoe believes that it will not succeed in California, but that it may do well in southern Florida. Seedling trees are now being cultivated in the Plant Introduction Garden at Miami.

A related species, *H. oralis* n. sp., collected by H. Pittier in Costa Rica several years ago, is also described.

**Further observations upon the application of manure in citrus orchards with the furrow-manure system**, A. D. Shamel (*Cal. Citrogr., 4 (1919), No. 12, pp. 332, 333, figs. 8*).—The author here describes and illustrates a cheap home-made plow, which has been found to make a much more satisfactory furrow than the ordinary walking plow in applying manure by the furrow-manure system (E. S. R., 40, p. 246). This system is coming into increasing use in California in citrus orchards.

**Efficiency in citrus irrigation**, F. M. Eaton (*Chula Vista, Cal.: The San Diego Land Corporation [1919], pp. 16, figs. 10*).—The author emphasizes the need for greater efficiency in orchard irrigation, and analyzes a few of the factors which must be considered before proper irrigation is possible. Much of the data presented has special application to the Chula Vista district of California.

**Yields of Washington navel oranges in relation to pruning**, G. Surr (*Cal. Citrogr., 4 (1919), No. 11, pp. 290, 325*).—A contribution from the California Citrus Station describing pruning experiments started by the station in 1915 on a 20-acre grove of Washington navel orange trees, and giving the yields for the four years 1916–1919 under different methods of pruning.

The average total yields for the four seasons are 100 lbs. per tree lower on heavily pruned trees than on lightly pruned trees. The results, in general, suggest that any improvement in the quality of fruit due to pruning may be more than offset by the greater cost of the resulting smaller crop. Light pruning, in this experiment at least, was more satisfactory than heavy pruning.

**Immature citrus fruits: Laws, rules, and regulations**, R. E. Rose (*Tallahassee, Fla.: T. J. Appleyard, 1918, rev., pp. 24, fig. 1*).—This pamphlet contains laws, rules, and regulations defining immature citrus fruits and fixing standards for mature citrus fruits, together with the rules, regulations, and methods for applying the "ratio of acid to total solids" test by inspectors. Instructions to growers for applying the test are also given.

**Cocoa production in the British Empire** (*Bul. Imp. Inst. [So. Kensington], 17 (1919), No. 1, pp. 40–95*).—A comprehensive account of the present production of cocoa within the British Empire, including also statistics on cocoa production in foreign countries.

**First report on activities in connection with the selection of coffee and cacao**, G. Stahel (*Dept. Landb. Suriname Bul. 36 (1919), pp. 24*).—An account of work accomplished in the selection and recording of high-yielding trees, the propagation of stocks, and budding and grafting, and in the increase of propagating wood on particularly good yielding trees.

**Improvement of coffee by seed selection and hybridization**, R. D. Anstead (*Agr. Jour. India, 14 (1919), No. 4, pp. 639–644*).—A paper on this subject in which the author calls attention to some results of hybridization and selection work with coffee in the Dutch East Indies and South India.

At Dubari, A. H. Jackson has produced a hybrid which is fertile and comes true to seed. It is a vigorous, healthy type of *arabica* coffee, apparently disease-resistant to a high degree. It comes into bearing early and gives a high yield.

**Manuring experiments in tea garden, IV,** C. BERNARD and J. J. B. DEUSS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefsta. Thee, No. 62 (1919), pp. 29, pls. 2, figs. 8*).—Manuring experiments conducted in a number of tea gardens in Batavia during the years 1916–17 are reported.

**The walnut tree, its propagation and care,** F. SCHÖNBERG (*Der Walnutzbaum, Seine Anzucht und Pflege. Stuttgart: Eugen Ulmer, 1917, pp. VII+77, figs. 35*).—A short treatise on the culture of the Persian walnut (*Juglans regia*), including a description of the more important varieties.

**The National rose test-garden in 1918,** F. L. MULFORD (*Amer. Rose Ann. 1919, pp. 116–122*).—This report covers the two principal groups of cut-flower roses, the Hybrid Perpetuals and the Teas and their hybrids, for the seasons 1917 and 1918 as far as the different varieties were available for observation during this period. The data given show the year when received, general average height of the plant, growth habit, growth of the foilage, time of first bloom, and average number of blossoms per plant each month during the growing period.

**Frank N. Meyer's rose contributions,** P. BISSET (*Amer. Rose Ann. 1919, pp. 38–41, pls. 2*).—A brief account of the various rose species collected by F. N. Meyer during his Chinese explorations. Reference is also made to a number of other ornamentals, as well as fruits and nuts, collected by Meyer.

**Rose-breeding notes for 1918,** W. VAN FLEET (*Amer. Rose Ann. 1919, pp. 29–34*).—A progress report on breeding investigations conducted by the author during 1918 at the Bell Experiment Plat, Glenn Dale, Md. The breeding work is being conducted primarily for the production of hardy garden varieties.

**Fragrant roses,** W. VAN FLEET (*Amer. Rose Ann. 1919, pp. 14–20*).—A general discussion of various types of fragrant roses and various forms of rose fragrance and the production of attar of roses. A list is given of species and varieties that have proved themselves satisfactory to the author from the standpoint of fragrance.

**Monograph on the doubling phenomenon in tulip flowers,** K. ORTLEPP (*Monographie der Füllungserscheinungen bei Tulpenblüten. Leipzig: Theod. Oswald Weigel, 1915, pp. VI+267, pls. 3, figs. 8*).—In this monograph the author presents in detail the results of long-continued studies relative to the method and nature of doubling in tulip blooms. In part 1 is described various forms of doubling and the method of doubling in different kinds of tulips. Part 2 describes the cultural experiments conducted and the influence of various cultural methods upon doubling. Appended to the monograph are notes on the culture of tulips in beds and the forcing of tulips in pots and under glass.

Briefly summarized, the author's investigation shows that the intensity and method of doubling in tulips is quite variable. The flowers of daughter bulbs are only occasionally double like those of the mother bulbs, and the flowers of the sister bulbs rarely ever show similar doubling.

All floral parts are, in their development and number, undergoing a continuous change from generation to generation. Cultural experiments conducted for a number of years show that rich manuring causes an increase, and moderate and no manuring a decrease in doubling. Doubling was specially stimulated by manures having a high nitrogen content.

**Tulips and their ways,** W. R. DYKES (*Gard. Chron., 3. ser., 66 (1919), Nos. 1703, pp. 89, 90, figs. 4; 1705, pp. 113, 114, figs. 4*).—A discussion of the growth behavior of the wild species of tulips.

**Small atlas of wild, useful plants,** W. OBERMEYER (*Schreibers Kleiner Atlas der Wild-Nutzpflanzen. Munich: J. F. Schreiber [1918], pp. 36, pls. 12, fig. 1*).—The atlas contains colored illustrations of wild vegetables, berries, fruits, and

other useful plants, including notes on their distinguishing characteristics and uses.

**Our more important wild, medicinal, aromatic, and tea plants**, H. Ross (*Unsere Wichtigeren Wildwachsenden Heil-, Gewürz- und Teepflanzen. Munich: Natur und Kultur, 1918, pp. 128, figs. 51*).—A descriptive account of the native medicinal, aromatic, and tea plants of Germany, including information relative to their cultivation and use.

## FORESTRY.

**Annual report on the progress, literature, and important happenings in the realms of forestry, hunting, and fishing for the year 1914**, H. Weber (*Allg. Forst u. Jagd Ztg., 1915, Sup., pp. VIII+148*).—In continuation of previous reports (E. S. R., 33, p. 49), this supplement contains abstracts of the more important world literature dealing with various phases of forestry, together with notes on the principal occurrences relating to forestry, hunting, and fishing during 1914.

**Massachusetts and her forests**, F. W. Rane (*Boston: State, 1919, pp. 7*).—A brief summary of the present status of forestry in Massachusetts, including recommendations relative to future forest policies.

**Commercial forestry in Britain: Its decline and revival**, E. P. Stebbing (*London: John Murray, 1919, pp. VI+186, pl. 1*).—The author reviews the history of forestry in Great Britain since the days of the Roman occupation, discusses the present and future position as regards the provision of timber supplies essential to the industries of the country, and then examines the afforestation problem in its various aspects. Afforestation is considered under the following general headings: What afforestation will do for the people, what afforestation will do for the Nation, forestry, and agriculture, the protection of the afforested areas, forestry education, State owned *v.* privately owned forests, and the afforestation schemes.

**Forest-making in the United Kingdom**, S. L. Bastin (*Jour. Bath and West and South. Counties Soc., 5. ser., 13 (1918–19), pp. 45–54*).—The author considers the problem of reforestation in Great Britain and gives a descriptive list of some of the most valuable timber trees that are especially suitable for planting in that country.

**[Report of the] mission for the study of forest conditions sent to the French Colonies by the ministries of war, armament, and the colonies.—I, The woods of the Ivory Coast; II, The woods of Gabon**, A. Bertin et al. (*Mission d'Etudes Forestières Envoyée dans les Colonies Francaises par les Ministères de la Guerre, de l'Armement, et des Colonies.—I. Les Bois de la Côte d'Ivoire; II. Les Bois du Gabon. Paris: Govt., 1918, vols. 1, pp. [10]+179, pls. 9, figs. 2; 2, pp. [7]+307, pls. 18, fig. 1*).—During 1916 and 1917 the senior author headed a Government mission to the French Colonies of East Africa to study the possibilities of exploiting the colonial forests. The two volumes here noted give the results of studies made in the Ivory Coast and in Gabon.

In the Ivory Coast some 62 species and in Gabon some 90 species were selected by the mission as being of practical value for replacing European woods, some for general industrial uses and others for special uses. Information is given relative to the local and technical nomenclature of these woods, their physical properties, uses, distribution, and supply.

**The native forests of western Australia**, M. Zalocostas (*Ann. Gembloux, 25 (1919), Nos. 2, pp. 60–75; 3, pp. 98–109*).—An account of the native forests of western Australia and the economic importance of their products, including

descriptions of a number of species which the author believes to be suitable for reafforestation in the Mediterranean Basin.

**Administration report of the forest circles in the Bombay Presidency, including Sind, for the year 1917–18** (*Admin. Rpt. Forest Circles Bombay, 1917–18, pp. II+178+3*).—A progress report on the administration and management of the State forests in the Northern, Central, Southern, and Sind Circles of the Bombay Presidency, including a financial statement for the year 1917–18. All important data relative to alterations in areas, forest surveys, working plans, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

**Report on the forest administration of the Central Provinces for the year 1917–18**, M. Hill (*Rpt. Forest Admin. Cent. Provs. [India], 1917–18, pp. 10+35+LXXI*).—A report similar to the above relative to the administration of the State forests of the Northern, Southern, and Berar Circles of the Central Provinces for the year 1917–18.

**Annual administration report of the forest department of the Madras Presidency for the twelve months ended June 30, 1918**, H. A. Latham, H. B. Bryant, P. M. Lushington, and C. D. McCarthy (*Ann. Admin. Rpt. Forest Dept. Madras, 1918, pp. 80+LVII+11*).—The usual progress report (E. S. R., 38, p. 846) relative to the administration of the State forests in the Northern, Central, Southern, and Western Circles.

**Progress report of forest administration in the Punjab for the forest year 1917–18**, R. McIntosh (*Rpt. Forest Admin. Punjab, 1917–18, pp. [12]+13+LI, pl. 1*).—A report similar to the above relative to the administration of the State forests of the Punjab for the year 1917–18.

**Report on the forest administration of the United Provinces for the year 1917–18**, P. H. Clutterbuck (*Ann. Rpt. Forest Admin. United Provs. India, 1917–18, pp. [6]+44+LX+7*).—A report similar to the above relative to the administration of the State forests of the United Provinces, including a financial statement for the forest year 1917–18.

**Influence on the dimension of trees on the efficacy of the thinning**, E. Mer (*Rev. Eaux et Forêts, 57 (1919), Nos. 7, pp. 141–146; 8, pp. 165–175*).—Investigations conducted by the author with stands of fir indicate that in order to secure maximum results from thinning the operation should be started when the trees are young. It is concluded that most thinnings are conducted too late, and the resulting stands are consequently less productive.

**Notes on acacia, II–III**, J. H. Maiden (*Jour. and Proc. Roy. Soc. N. S. Wales, 51 (1917), pp. 71–124, 238–274, pls. 4*).—Continuing the series previously noted (E. S. R., 36, p. 45), the first of these articles consists of a contribution to the bibliography of the genus Acacia in tropical Western Australia, including descriptions of new species of Acacia. The second article deals similarly with extra-tropical Western Australia.

**Flower development and branch growth of the red beech (Fagus sylvatica)**, M. Büsgen (*Ztschr. Forst u. Jagdw., 48 (1916), No. 6, pp. 289–306, figs. 18*).—The results of a study of reproduction and growth in the red beech are presented.

**Notes on Eucalyptus, with a description of a new species, V**, J. H. Maiden (*Jour. and Proc. Roy. Soc. N. S. Wales, 51 (1917), pp. 445–466*).—In continuation of previous papers (E. S. R., 36, p. 45), supplementary notes are given on several species of Eucalyptus, and a new species, *Eucalyptus stowardi*, is described.

**Some ironbarks of New South Wales**, R. T. Baker (*Jour. and Proc. Roy. Soc. N. S. Wales, 51 (1917), pp. 410–422, pls. 5*).—According to the author

*Eucalyptus paniculata*, as previously systematically placed, includes four distinct timbers varying in color and other qualities. It is here proposed to take the white, gray, or light chocolate-colored timber as the type *E. paniculata* and to give specific rank to the other three timbers as follows: Bloodwood-bark ironbark (*E. fergusoni* n. sp.), pink ironbark (*E. nanglei* n. sp.), and narrow-leaved ironbark (*E. beyeri* n. sp.).

These species are described and illustrations are given of the fruits and the color and texture of the woods.

**[Rubber investigations on the Gold Coast, 1916 and 1917]** (*Govt. Gold Coast, Rpt. Agr. Dept., 1916, pp. 3, 4, 6, 7, 8, 15, 16, 20, 25, 26, 27, 29, 30, 31, 32–34, 35, 37, 38, 40, 42, 43, 48, 49, 52, 55, 56; 1917, pp. 3, 5, 6, 7, 12, 23, 24, 25, 27, 30, 31, 32–37, 39, 41, 42, 45, 46, 47, 54, 55, 57, 59, 60, 61*).—Progress reports on cultural and tapping experiments with various kinds of rubber at the various agricultural stations and substations in the Government of the Gold Coast.

**On the occurrence of crystals in some Australian timbers**, R. T. Baker (*Jour. and Proc. Roy. Soc. N. S. Wales, 51 (1917), pp. 435–444, pls. 9*).—Out of 22 orders of Australian trees examined, calcium oxalate crystals were found to occur in the secondary wood of 15. A descriptive list is given of the species in which crystals were found, including illustrations of microsections of the wood showing the crystals.

## DISEASES OF PLANTS.

**Studies on Fusarium diseases of potatoes and truck crops in Minnesota**, G. R. Bisby (*Minnesota Sta. Bul. 181 (1919), pp. 5–58, figs. 30*).—Results are given of the study of Fusarium diseases of potatoes and truck crops, the investigations being made during the summers of 1916, 1917, and 1918. In addition to the rots of potato tubers, Fusarium diseases of peas, beans, sweet corn, various cucurbits, and tomatoes were studied.

The potato wilt, due to *F. oxysporum*, the Fusarium dry rot of the tubers, due very largely to *F. discolor sulphurcum*, and the wilts of the various truck crops named above, are described. Studies were made on the effect of temperature, moisture, and other factors on the growth of the organisms. Results from cross inoculations are described, and suggestions made for control measures, particularly for the prevention of potato wilt and potato dry rot.

Cross inoculations seem to indicate that the wilt or root rot producing Fusaria may exhibit a selective tendency in their common occurrence on certain host plants, although they are semiparasitic in their action, being distinctly influenced by conditions unfavorable to the host plant. The isolations and cross inoculations made demonstrate that no single species of Fusarium is responsible for the common storage rots of vegetables, cucumbers, and tomato fruits. The author claims that all the organisms produced substances in old solutions that inhibited the germination of the same or other fungi. After boiling, such old solutions allowed normal germination. The species of Fusaria studied were found to withstand considerable desiccation and exposure to low temperatures or to alternate freezing and thawing, and can utilize a wide variety of food substances. Although many of the species are parasites, Fusaria are efficient saprophytes.

**Fungus diseases [in Ceylon]**, T. Petch (*Ceylon Agr. Soc. Year Book, 1919–20, pp. 114–120*).—This contains a general discussion of diseases and remedies therefor in such locally occurring plants as arrowroot, artichoke, okra, beans, beet, eggplant, crucifers, celery, chillies, cucumber, pumpkin, dhall (pigeon pea), peanut, horseradish, mustard, pea, and tomato.

**Cooperation in plant quarantine service among (the) Pan American countries**, J. R. JOHNSTON (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 884–888*).—This discussion is in line with those previously noted (E. S. R., 41, p. 654). A short list of related publications is also given.

**Concerning the introduction into the United States of extra limital wood-destroying fungi**, J. R. WEIR (*Mycologia, 11 (1919), No. 2, pp. 58–65*).—Recent observations noted in part (E. S. R., 39, p. 357) regarding fungi as related to climatic modifications due to altitude are here cited to support the view that extended investigations in tropical countries are highly desirable in order to increase the safeguards against the importation of plant disease fungi, which may here find more favorable conditions and cause more injury than is usual to them in their native environment.

**New Japanese fungi: Notes and translations, IV**, T. TANAKA (*Mycologia, 10 (1918), Nos. 2, pp. 86–92; 6, pp. 285–288; 11 (1919), Nos. 2, pp. 80–86; 3, pp. 148–154*).—This continues the series formerly noted (E. S. R., 39, p. 753).

**A novel method of ascospore discharge**, D. ATANASOFF (*Mycologia, 11 (1919), No. 3, pp. 125–128, figs. 3*).—The author notes a method of ascospore discharge, observed in species of Pyrenophora and Pleospora, which is described as unique and somewhat complicated.

**A study of some factors influencing the stimulative action of zinc sulphate on the growth of Aspergillus niger.—II, A comparison of two strains of the fungus**, R. A. STEINBERG (*Bul. Torrey Bot. Club, 46 (1919), No. 1, pp. 1–20, figs. 4*).—Continuing previous work (E. S. R., 40, p. 222), the author publishes some results of interrupted work and observation involving two strains of *A. niger* which were continued for more than six months. The apparent effects of zinc are noted with discussion.

The author considers it probable that the differences apparent in the literature of the subject between the results obtained by different investigators are at least in part attributable to the use of strains having different zinc optima. The unrecognized presence of zinc in minute quantity may have been, it is thought, an additional factor in such cases.

**Studies in the genus Gymnosporangium.—II, Report on cultures made in 1915 and 1916**, B. O. DODGE (*Bul. Torrey Bot. Club, 45 (1918), No. 7, pp. 287–300, pl. 1*).—The author has followed up as far as 1918 his work related to that previously reported (E. S. R., 35, p. 244; 41, p. 152), and gives a tabulation with discussion of observations made on cultures of *G. clavipes*, *G. macropus*, *G. globosum*, *G. ellisii*, *G. clavariæforme*, *G. juvenescens*, *G. nidus-avis*, *G. transformans*, and *G. fraternum*.

**Studies in the genus Gymnosporangium.—III, The origin of the teleutospore**, B. O. DODGE (*Mycologia, 10 (1918), No. 4, pp. 182–193, pls. 3*).—Having employed as material for this work some of the above-named fungi, the author gives an account with discussion of his observations. The origin of the teleutospores from the subterminal cells of the tissues composing the primordium has been shown to be a very common method in this genus of the rusts. The hosts attacked by the six species studied represent three species and two genera of conifers.

**Take-all and flag smut, two wheat diseases new to the United States**, H. B. HUMPHREY and A. G. JOHNSON (*U. S. Dept. Agr., Farmers' Bul. 1063 (1919), pp. 8, figs. 4*).—A popular description is given of take-all and flag smut, two diseases of wheat and other cereals which have recently been discovered in the United States. The take-all disease, which is attributed to *Ophiobolus graminis*, is believed to be identical with this disease in Australia and Europe. It first made its appearance in Madison County, Ill., and as reported July 25, 1919, it

had been found in three counties in Illinois and three in Indiana. The flag smut, which is caused by *Urocystis tritici*, is reported from Madison County, Ill. Attention is called to these diseases in order that the occurrence might be reported and their possible spread prevented. Suggestions are given for their control, which are based largely on proper rotations, and for the flag smut the treatment of seed before planting.

[Barberry and wheat rust], E. M. FREEMAN (*Minn. Hort., 46 (1918), No. 4, pp. 168–170, figs. 2*).—This is a brief exposition of contrasts between the common barberry (*Berberis vulgaris*) as a bearer of wheat rust and the Japanese barberry (*B. thunbergii*), which is harmless in this respect, with a discussion of the success attending the eradication of the former species, which is a host of the black stem rust.

**Ear cockles in wheat**, W. SOMERVILLE (*Jour. Bd. Agr. [London], 25 (1918), No. 7, pp. 850–853, fig. 1*).—In experiments carried out with the varieties Nursery and Dutch White Wheat, it was found that steeping for 24 hours in 1 per cent copper sulphate solution reduced nematode infection and gave a considerably increased percentage of sound grains.

**Smut diseases of barley and oats**, W. B. and S. P. MERCER (*Jour. Bd. Agr. [London], 25 (1919), No. 12, pp. 1486–1493, pls. 2*).—This paper is complementary to the one previously noted (E. S. R., 37, p. 839), and is intended to complete the account of smuts affecting the ordinary food cereals in England. The series concludes with a synoptic survey in tabular form of such diseases, their diagnostic symptoms, and appropriate treatments.

**Segregation of susceptibility to parasitism in maize**, D. F. JONES (*Amer. Jour. Bot., 5 (1918), No. 6, pp. 295–300*).—The inbred strains of maize reported upon by East and Hayes (E. S. R., 27, p. 428), continually selfed up to the time of this report, are said to show striking differences in the number of plants affected by the smut fungus (*Ustilago zeæ*) and an unidentified leaf blight organism. This organism in 1914 injured seriously a few inbred strains of flint maize and in 1916 affected the same strains in the same way, other selfed strains from different varieties in adjoining rows being almost entirely free from this organism. First generation hybrids of these susceptible strains with resistant types grown in the same field were only slightly affected. No plants showed in 1917 any injury from the leaf-blight fungus, but several strains were seriously attacked by smut. The data are tabulated for studies carried out on the susceptibility of strains differing as to genetic history.

The facts here recorded are considered as additional support to the hypothesis previously advanced by the author (E. S. R., 38, p. 367; 40, p. 226) that the increase in development commonly shown by hybrids is due to conjunctive action of a large number of favorable, dominant growth factors contributed by both parents. Vigor is thought to be, in this case, only a minor factor causing variation. The evidence from these inbred strains of maize and their first and second generation hybrids is thought to show that susceptibility is governed by factors capable of being segregated into some lines and not into others, the modification of the expression of parasitism by the vigor of the plants being a minor consideration.

**A bacterial root rot of field corn**, H. R. ROSEN (*Arkansas Sta. Bul. 162 (1919), pp. 3–7, pls. 4*).—A description is given of a disease of field corn which was observed by the author on a farm in this State. The characteristic feature of the disease is said to be shown when the stalks are cut through their long axis. The lower node or joints to which the roots are attached showed a purplish-brown discoloration on the cut surface, while the internodes preserved their normal white color. The extreme base of the stalk was similarly

discolored, and the brownish tissue was either dead or in the process of discoloration. From this tissue a bacterial organism was obtained, and inoculation experiments indicate that it was responsible for the trouble. The author reviews some of the literature pertaining to the bacteria which cause diseases of corn, pointing out some of the differences, but makes no attempt to describe the organism at present. Attention is called to a bacterial disease of foxtail previously described (E. S. R., 40, p. 643), but the organisms isolated from foxtail and corn roots and leaves have not been identified as the same species.

**Seed potatoes and potato diseases**, G. R. Bisby (*Minn. Hort., 46 (1918), No. 4, pp. 164–167, figs. 2*).—In addition to precepts based on experiences regarding the maintenance and improvement of potatoes through breeding operations, the author gives an account of experiments carried on for some years with potato late blight. This disease was best controlled with Bordeaux mixture, the beneficial effects (as evidenced in the increased yield in case of Rural and Early Ohio) increasing with the concentrations employed ranging from a 2:2:50 to 5:5:50 solution.

**Investigations on potato diseases, IX–X**, G. H. Pethybridge (*Dept. Agr. and Tech. Instr. Ireland Jour., 18 (1918), No. 4, pp. 410–416; 19 (1919), No. 3, pp. 271–292, pls. 2*).—The continuation of this work (E. S. R., 39, p. 249) was still somewhat limited in scope during the season of 1917, though experiments were carried out at two stations, both in the County of Galway. The first outbreak of blight (*Phytophthora infestans*), noted June 12, was retarded by good weather, but August was favorable to the spread of blight. Spraying, however, reduced the loss considerably.

Burgundy mixture alone was used in 1917, this fungicide being more convenient to prepare and apply, equal to Bordeaux in efficacy, and generally preferred by farmers in Ireland. The diffierences observed as between the 1 and the 2 per cent strength were slight, though the latter is preferred where only two sprayings are employed and where cost of material is not the prime consideration.

Resistance was shown by a few varieties in marked degree. Clifden Seedling and Champion II were almost completely resistant, while "K" Seedling, Shamrock, and Northrn Invincible were less so. Great Scot, Provost, Kerr Pink, Dominion, and Burnhouse Beauty, though known to be immune to wart disease (black scab) (which is, however, absent from the west of Ireland), were not resistant to blight (*P. infestans*), to corky or powdery scab (Spongospora), or to pink rot (*P. erythroseptica*).

The work carried out in 1918 was also somewhat limited in scope, consisting chiefly in spraying trials against ordinary blight, though trials on a small scale with certain disease resistant varieties were carried on this year.

Conditions for the spread of blight were on the whole not very favorable. The efficacy of the 2 per cent and that of the 1 per cent Burgundy mixture were practically equal. A second and a third spraying were highly remunerative in every case; a fourth spraying was so in three cases and paid for itself in the fourth instance. Any physiological check attending the use of the spray was small and temporary. Substitutes for soda were tried with somewhat favorable but not conclusive results.

Blight resistance showed a general correspondence to the tendencies noted the previous year. Pink rot (*P. erythroseptica*) was very prevalent in some western districts in 1918, causing considerable loss. Varieties resistant to black scab (though not to pink rot) as named in order of their resistance were Kerr's Pink, Dominion, Burnhouse Beauty, Provost, and Great Scot.

Silver scurf (*Spondylocladium atrovirens*), which is of little importance beyond the results due to a slight skin blemish of the tuber, was widely preva-

lent in 1918. It was found difficult to control this trouble with formaldehyde solution without injuring the eyes. Mercuric chlorid solution at 0.1 to 0.2 per cent injured the tubers (without killing the fungus), causing at each lenticel a spotting appearance resembling pit rot, which is itself supposed to be caused by the entrance of some poisonous gas, vapor, or liquid. Experiments with heat showed that an exposure of cultures to temperature of 43–43.5° C. (109.4 to 110.3° F.) for 18 to 24 hours kills the fungus. However, tests with infected potato tubers showed that these are not able to endure treatments by heat sufficient to kill the fungus of silver scurf.

Leaf roll was not produced by heating seed tubers to 42 or 43° for 5, 12, 20, or 40 hours after a preliminary heating of 2 hours.

Pit rot is described. It is thought to be due neither to the fungi generally associated with the pits nor to bacteria, and it does not appear to be hereditary. A very similar or identical rot has been produced artificially. It is thought that some gas may be the cause of this rot, which, as above noted, starts at the eyes of the tubers. Ventilation of the pit and exclusion of diseased tubers are recommended.

**Potato-spraying experiments at Wye College Fruit Experiment Station, East Malling, Kent,** E. S. Salmon and H. Wormald (*Jour. Bd. Agr. [London], 26 (1919), No. 1, pp. 71–77, pl. 1*).—Although the practice of spraying the main crop varieties of potatoes is almost invariable, that of spraying such second early varieties as British Queen has not become general, notwithstanding the fact that such varieties frequently suffer severely from blight. Field experiments were carried out during 1918 with this variety. It was found that, under certain seasonal conditions, one application of Bordeaux or Burgundy mixture resulted in loss on account of its lengthening the period of ripening without protecting the crop from blight; while, under the same seasonal conditions, two sprayings increased the yield 2⅝ and 1½ ton per acre for these two mixtures, respectively.

**Blast of paddy,** W. McRae (*Agr. Jour. India, 14 (1919), No. 1, pp. 65–70*).—An account is given of the shortage of the 1918 second rice crop of the variety of rice (*Oryza sativa*) called Korangu Samba. This disease is described as being due to the fungus *Piricularia oryzæ*, which is noted as causing much damage to rice in certain other countries. The consensus of opinion connects the susceptibility of rice to this disease with the employment of nitrogenous fertilizers.

**A disease of the yam,** E. M. Wakefield (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 6 (1918), pp. 199–201, fig. 1*).—A disease affecting *Dioscorea prehensilis* in the southern provinces of Nigeria is described. The disease attacks the stems, rarely the whole vine, preferring poor or swampy situations, and confining itself to the round-stemmed yams. The fungus is considered a new species of Bagnisiopsis, and is described under the name *B. dioscoreæ*.

**Vegetable diseases and their remedies,** G. B. Hoerner (*Minn. Hort., 46 (1918), No. 4, pp. 148–154, figs. 4*).—This is an address to Minnesota vegetable growers, having in view the needs associated with the war conditions then existing.

**Preventing winter injury to fruit trees,** J. C. Whitten (*Minn. Hort., 46 (1918), No. 10, pp. 364–367*).—In Missouri, as contrasted with Minnesota, winter injury to fruit trees is ordinarily due rather to the occurrence of warm, sunny days in winter than to extreme or continued cold. On such days thermometers inserted in a fruiting twig of a peach tree often registered from 15 to 20° higher than in the air around them, the result of this condition being that the buds swelled, became tender, and were thus liable to be killed during the cold nights which followed.

Spraying of twigs with whitewash kept these buds at the same temperature as the atmosphere by reflecting the sun's heat. As a result, the buds swelled and bloomed considerably later on these than on the unsprayed trees. In 10 years two crops are said to have been saved by this means, although this plan has not yet proved a commercial success. Other means of securing the desirable late and prolonged rest include severe pruning during the previous winter, judicious thinning of fruit, growing and turning under cowpeas, and otherwise maintaining the growth until late in the season.

**The menace of silver leaf** (*Jour. Bd. Agr. [London], 25 (1918), No. 7, pp. 870, 871*).—Reports indicate the increasing seriousness of silver leaf disease in fruit trees, this trouble almost amounting to a scourge in some localities, threatening with extinction some of the choicest varieties of plum, and attacking apples somewhat less frequently.

The only treatment found effective is early and thoroughgoing removal and destruction of all affected trees or parts thereof.

**Growth of apple trees injured in the nursery by crown gall and woolly aphis**, W. J. Schoene and R. R. Reppert (*Quart. Bul. Va. State Crop Pest Comm., 1 (1919), No. 2, pp. 3–11, figs. 10*).—In view of the indefinite state of opinion, information, and practice regarding the sale, shipping, and planting of nursery stock showing evidence of crown gall or woolly aphis, investigation was made of these features on an orchard planted in 1914 and partly dug out four years later.

It is found that hard crown galls on or near the graft union grow as rapidly as does the tree itself. Hairy root disappeared in some instances, crown-gall tissue developing in the same region. Generally speaking, trees with galls made less growth than did trees free from gall. Trees severely injured by woolly aphis in the nursery are regarded as unfit for planting. Trees slightly injured may recover and develop a satisfactory root system.

**Field experiments in spraying apple orchards for the control of apple blotch**, A. J. Gunderson (*Illinois Sta. Bul. 222 (1919), pp. 551–575*).—Apple blotch is said to be one of the most destructive diseases of apple orchards in southern Illinois. Experiments for its control were carried on during 1916, 1917, and 1918 to determine the relative values of Bordeaux mixture and lime sulphur; the value of different applications of these fungicides, and the effect of interchanging them; the effect of dormant applications of copper sulphate, Scalecide, lime sulphur, and a combination of lime sulphur and copper sulphate; the effect of the addition of arsenate of lead to lime sulphur; and the relative values of dusting and spraying.

Bordeaux mixture and lime sulphur have been found practically equal for the control of apple blotch. Dormant applications of the fungicides proved of no value for checking the disease. Arsenate of lead appears to have the same value as a spray for prevention of blotch, but the addition of this material to lime sulphur did not increase the value of that spray. Dusting with a mixture of finely ground sulphur and powdered arsenate of lead was valueless for the control of the disease. The most important application of lime sulphur or Bordeaux mixture was three weeks after the fall of the petals; and the second important application is that given five weeks after their fall. Later applications were found of little value in reducing blotch infection.

**An undescribed species of Ophiodothella on Ficus**, E. A. Bessey (*Mycologia, 11 (1919), No. 2, pp. 55–57, pl. 1*).—An account is given of a fungus found on fig leaves at points near Miami, Fla., in 1907 and 1908. The species is considered new and has been designated as *O. fici*.

**Spraying [grapevines for downy mildew] after July 15**, A. CADORET (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 39 (1918), No. 27, pp. 9, 10*).—Reaffirming (E. S. R., 40, p. 750) the necessity and efficacy of thorough spraying with Bordeaux mixture at intervals of 8 to 12 days in very moist weather between June 10 and July 15, or of monthly spraying during an ordinarily dry summer, the author insists also on the necessity of prolonging such treatment until the crop is gathered in case black rot is present.

**The action of copper on vegetation**, A. CADORET (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 39 (1918), No. 40, pp. 319, 320*).—The author states from previous observations, recorded above, that in ordinarily dry summers mildew attacks during August are sufficient to decrease the foliage of grapevines. Vines properly sprayed (as evidenced by the resulting blue coating) retain their healthy appearance despite any deficiency of nutrition associated with lack of moisture, therein showing resistance to drought as well as downy mildew. The bearings of the facts observed are discussed.

**Further notes on the powdery mildews and the ammonium polysulphid wash**, J. V. EYRE, E. S. SALMON, and L. K. WORMALD (*Jour. Bd. Agr. [London], 25 (1919), No. 12, pp. 1494–1497*).—During the past three years further investigations (E. S. R., 38, p. 853) have been carried out on the control of powdery mildews by means of washes containing sulphur. The object of the present article is to give notice of new facts discovered relative to the killing point of powdery mildews, and of an improved formula for making the concentrated ammonium polysulphid solution. The work was carried out with hop mildew (*Sphærotheca humuli*), but the facts as noted are thought to apply to other mildews.

In making up the stock solution, 1 gal. of a 30 per cent aqueous solution of ammonia is saturated at ordinary temperature with hydrogen sulphid gas until the density is 0.955. Two gallons of 30 per cent aqua ammoniæ are added and 112.5 oz. of sulphur stirred into the liquid. Hydrogen sulphid gas is then passed through the liquid until all the sulphur dissolves and the density reaches 1.036 at 17° C. (62.6° F.). The resulting clear dark-colored solution constitutes the new stock solution, and this is referred to as ammonium polysulphid stock solution, 1918, or as A. P. S., 1918. This should contain 19.2 per cent ammonia and 24.2 per cent of sulphur, of which 10.6 per cent is in the condition known as sulphid sulphur, and 13.6 per cent in the form known as polysulphid sulphur. After standing 12 hours and being diluted with approximately 50 to 100 times as much water, the fluid may become cloudy and finally thick with sulphur.

To prepare this diluted wash 5 lbs. of soft soap (or 10 lbs. if the water is very hard) are dissolved in 99 gal. of water, after which 1 gal. of the stock solution, A. P. S., is added while stirring to give strength (a). Strength (b) requires the same proportion of soap with twice the percentage of stock solution. Both these are to be used as soon as made. Precautions as regards handling are the same as those for lime sulphur. A nozzle giving a fine misty spray is required.

Lime-sulphur is thoroughly reliable for early sprayings against American gooseberry mildew, but it should be dispensed with in favor of the above-described wash before the marketing qualities of the berries are affected.

**Further data on the citrus canker affection of the citrus species and varieties at Lamao**, H. A. LEE (*Philippine Agr. Rev., 11 (1918), No. 3, pp. 200–206, pls. 7*).—Investigations begun by the author in 1917 on possible control methods for citrus canker have yielded data which are here presented in tabular form, with discussion to supplement the observations recorded by

Wester (E. S. R., 39, p. 458). Attention is called to the appearance of susceptibility in varieties formerly listed as immune; also of partial or complete immunity appearing in other varieties which are indicated.

**Carnation stem rot and its control**, G. L. PELTIER (*Illinois Sta. Bul. 223 (1919), pp. 579–607, figs. 5*).—The author describes some experimental work undertaken with a view to the control of carnation stem rot due to *Rhizoctonia solani* noted in a previous publication (E. S. R., 35, p. 749). The general character of the fungus, together with an account of its occurrence, is given. The conditions influencing the growth of the parasite and host plant are described at considerable length, and accounts are given of experiments carried on in the greenhouse for the control of the stem rot.

From the data obtained, it appears that the control of stem rot of carnation is to be studied along the lines of growing conditions and the use of clean soil. Soil disinfection proved of little value, but steam sterilization has been quite effective. In growing carnations the temperature should be kept as low as possible, and no more water applied to the soil than is absolutely necessary for the healthy growth of the plant. These statements apply also to the growing of the seedlings and cuttings. Steam sterilizaion of soil and sand is recommended to be used wherever possible.

**Snapdragon rust**, G. L. PELTIER (*Illinois Sta. Bul. 221 (1919), pp. 535–548, figs. 5*).—A description is given of rust of snapdragon due to *Puccinia antirrhini*, which is known to have been present in California since 1879 and which appeared in Illinois in 1913, since which time it has become the cause of considerable loss. The symptoms of the disease, description of the fungus, and host relationship and resistance are described, after which an account is given of experiments for its control. The use of Bordeaux mixture, ammoniacal copper carbonate, or Fungine can neither prevent, check, nor control it in the field or greenhouse.

Important relations were established between the spread of the fungus and the conditions under which the plants were grown. It is claimed that the practice of syringing plants in the greenhouse is favorable for the dissemination of the spores and the rapid infection of the plants. Watering from below only, so as to avoid wetting the foliage, is a means of checking the rust. The rust was not found to be carried on the seed, and it is believed that the disease could be avoided by the propagation of plants from seed instead of cuttings.

**Some diseases of trees in greater New York**, A. H. GRAVES (*Mycologia, 11 (1919), No. 3, pp. 111–124, pl. 1*).—The author gives some results of studies during the summer of 1918. The diseases noted, with associated fungi (which were not identified with certainty in all cases), include a bark disease (*Melanconium* sp.) of butternut (*Juglans cinerea*), canker (*Nectria* sp.) of sweet birch (*Betula lenta*), winter injury or leaf scorch of beech (*Fagus atropunicea*), heart rots (several fungi) of oaks (*Quercus* spp.), disease of the white oak (*Q. alba*), bark disease (*Creonectria purpurea*) of the paper mulberry (*Broussonetia papyrifera*), blight (*Gnomonia venata*) of sycamore (*Platanus occidentalis*), and heart rot (*Pyropolyporus robiniæ*) of locust (*Robinia pseudacacia*). Severe injury to trees during 1917 and 1918 is ascribed to the unprecedented combination of unfavorable winter conditions.

**[Direct] transmission of blister rust from pine to pine**, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 16 (1918), No. 3–8, pp. 280–282*).—This is a discussion of recent contributions on the life history of pine rust (*Peridermium pini*).

**Diaporthe taleola, an ascomycete injurious to oaks**, M. MOREILLON (*abs. in Internatl. Inst. Agr. [Rome], Internatl. Rev. Sci. and Pract. Agr., 9 (1918), No.*

*3, pp. 397, 398*).—In September, 1917, isolated and comparatively shallow rooted oaks on dry calcareous soil southwest of the Vaudois Jura at an altitude of 1,850 ft. were observed to have lost in some cases as much as 1 per cent of their twigs. The trouble proved to be due to *D. taleola*. The same fungus is said to have caused similar injury in other localities mentioned.

**The distribution of mistletoe in Switzerland**, J. Coaz (*Naturw. Ztschr. Forst u. Landw., 16 (1918), No. 3–8, pp. 138–195, figs. 3*).—A discussion of mistletoe in Switzerland concludes with a comparison between Switzerland and Germany as regards the occurrence, distribution, and hosts of mistletoe in the two countries.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Game laws for 1919**, G. A. Lawyer and F. L. Earnshaw (*U. S. Dept. Agr., Farmers' Bul. 1077 (1919), pp. 80*).—This is the usual annual summary of the provisions of Federal, State, and Provincial statutes (E. S. R., 40, p. 54).

**The animal ecology of Johnson County**, D. M. Brumfiel (*Univ. Iowa Studies Nat. Hist., 8 (1918), No. 1, pp. 37, pls. 23*).—A preliminary survey of the major animal habitats of Johnson County, Iowa, with an atlas.

**A nest study of the Maryland yellow throat**, N. E. Shaver (*Univ. Iowa Studies Nat. Hist., 8 (1918), No. 2, pp. 12, pls. 4*).—This paper is based upon a continuous study of the nest life of *Geothlypis trichas trichas*, made during the summer of 1917 at the Iowa Lakeside Laboratory on Lake Okoboji.

The nest studied contained three eggs of the yellow throat and one of the cowbird. The shell of the cowbird's egg by adhering to one of the yellow throat prevented the latter from hatching, causing 33⅓ per cent mortality. Data presented in tabular form show the feeding activity of the parent birds, distribution of food to the young, classification of nestling food, and sanitation of the nest. The data show that the cowbird received 55 per cent of all the food brought to the nest.

**A list of birds observed in Clay and O'Brien Counties, Iowa**, I. N. Gabrielson (*Proc. Iowa Acad. Sci., 24 (1917), pp. 259–272*).

**Birds of the Kansas City region**, H. Harris (*Trans. Acad. Sci. St. Louis, 23 (1919), No. 8, pp. 213–371, figs. 4*).—This work includes a summary of the dates on which the regular spring migrants may be looked for, residents which occur in the vicinity throughout the entire year, winter residents, irregular winter residents, summer residents, occasional or very rare breeders, former breeders, possible breeders, and migrants, a bibliography of 18 pages, and a subject index.

**Studies of the birds in northwest Australia**, R. Söderberg (*K. Svenska Vetensk. Akad. Handl., 52 (1918), No. 17, pp. 116, pls. 5, figs. 25*).—A report of ornithological researches conducted in tropical northwest Australia.

**Studies of the tsutsugamushi disease**, T. Kitashima and M. Miyajima (*Kitasato Arch. Expt. Med. [Tokyo], 2 (1918), No. 2, pp. 90–146, pls. 6*).—A further report of studies of this affection, also known as Nippon river fever, which is transmitted by the larva of a trombidiid (*Leptus akamushi*) that develops on field mice (*Microtus montibelli*). It occurs in certain river valleys of Japan and also in Formosa (E. S. R., 39, p. 870).

**Camallanus americanus n. sp.**—A monograph on a nematode species, T. B. Magath (*Trans. Amer. Micros. Soc., 38 (1919), No. 2, pp. 49–170, pls. 10, figs. 16*).—This monograph deals with a parasitic nematode found in the upper 2 in. of the intestine of certain turtles. Of 47 turtles examined 78 per cent were parasitized.

**Absence of complement in the blood of insects**, A. C. HOLLANDE (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 6, pp. 218–220*).—In investigations conducted the author failed to find complement present in the blood of a number of insects, including *Vanessa urticæ*, *V. io*, *Bombyx rubi*, *Chelonia caja*, *Sphinx ligustri*, *Decticus verrucivorus*, *Orphania denticaudata*, and *Ephippiger terrestris*.

**Guide to the collection and preservation of insects**, I. DE SAGARRA (*Mus. Barcinonensis Sci. Nat. [Mus. Cienc. Nat. Barcelona] Opera, Ser. Zool., No. 4 (1918), pp. 99, figs. 65*).—This is intended as an aid to the young entomologist.

**On the absence of insect pests in certain localities and on certain plants**, T. D. A. COCKERELL (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 345–347*).—The author records observations of the occurrence of garden insects at Boulder, Colo., in 1918.

**On some phases of insect control by the biological method**, H. S. SMITH (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 288–292*).—This is a discussion, based upon work of the California State Commission of Horticulture, in which the author considers the more important factors which govern control by entomophagous insects.

**Effect of excessive sterilization measures on the germination of seeds**, E. R. DE ONG (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 343–345*).—Experiments conducted with a view to determining the germination percentage of beans after treatment with excessive heat and excessive dosage of potassium of cyanid and carbon disulphid are reported in tabular form. It is shown that fumigation and heat sterilization are safe practices both for grains and legumes at the dosages commonly used, with proper precautions as to the length of exposure and ventilation afterwards.

**The stratification of liquid hydrocyanic acid as related to orchard fumigation**, R. S. WOGLUM and M. B. ROUNDS (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 300–303, pl. 1*).—The authors found that in each of the 11 experiments conducted where the liquids were brought together slowly stratification occurred regardless of whether the water was added to the hydrocyanic acid or the hydrocyanic acid to the water. If, however, the materials were brought together violently and thoroughly shaken stratification was not produced.

**The strength of nicotin solutions**, V. I. SAFRO (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 349–351*).—The author calls attention to the fact that neither odor nor color is an indication of the comparative strength of nicotin solutions. A statement of the percentage of nicotin content alone is insufficient as indicating its exact strength. "The nicotin may be in the form of 'free' nicotin or in the form of nicotin sulphate, but the percentage refers to the amount of nicotin, by weight, because it is the only method of knowing definitely how much actual nicotin is contained in the solution, and such designation is required by the Federal Insecticide Board. It is necessary, then, to know the specific gravity of the preparation in order to know the actual nicotin content."

**The value of molasses and sirups in poisoned baits for grasshoppers and cutworms**, A. W. MORRILL (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 337–343*).—The author concludes that molasses or sirup of any kind is absolutely unnecessary as an ingredient of poisoned baits against many of the common cutworms. The addition of molasses, however, increases the attractiveness of the bait for some species under certain conditions. Evidence has also accumulated to the effect that the use of molasses or sirup is unnecessary in combating some species of grasshoppers.

**Report of the State entomologist and plant pathologist** (*Tenn. Bien. Rpt. Dept. Agr., 1917–18, pp. 53–72, fig. 1*).—This report includes a discussion of the

occurrence of and control measures for a number of the more important insects of the year, including the wheat-joint worm, strawberry-root louse, cabbage-root maggot, bagworm, cotton boll weevil, Hessian fly, horn fly, ox warble, etc. A dormant and summer spray schedule for apple trees is appended.

**Insect enemies of the allotment holder**, F. V. THEOBALD (*Wye, England: Author, 1918, pp. 59, figs. 27*).—A brief popular account.

**Insect problems of western shade trees**, F. B. HERBERT (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 333–337*).—This is a brief summary of a survey made by the Bureau of Entomology of the U. S. Department of Agriculture in the fall of 1916.

**Notes on Thysanoptera from British Columbia**, R. C. TREHERNE (*Canad. Ent., 51 (1919), No. 8–9, pp. 181–190, pl. 1, figs. 8*).—The author presents notes on 10 species of thrips found to occur in British Columbia, including one new to science, namely, *Æolothrips auricestus* taken from western wild rye grass (*Elymus condensatus*).

**Some work of the insectary division in connection with the attempted introduction of natural enemies of the beet leaf-hopper**, E. J. VOSLER (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 5, pp. 231–239, figs. 9*).—This is a brief report by the late author on his trips to Australia in the attempt to secure enemies of the beet leaf hopper.

The saltbush (*Atriplex muelleri*) was found badly infested with a leaf hopper in the vicinity of Sunshine, near Melbourne, which was parasitized to the extent of 90 per cent by two egg parasites, *Ptergogramma acuminata* and a mymarid. Upon introduction into this country both failed to attack the beet leaf hopper, and as they were given a fair trial it is concluded that they found *Eutettix tenella* to be an unsuitable host.

**Notes on the behavior of the beet leaf-hopper (Eutettix tenella)**, H. H. P. SEVERIN (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 303–308*).—These notes relate to sexual behavior, nocturnal habit, reaction to heat, phototaxis, and reaction to shadow.

**Investigations of the beet leaf-hopper (Eutettix tenella) in California**, H. H. P. SEVERIN (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 312–326, pl. 1*).—The data here presented have been substantially noted from another source (E. S. R., 41, p. 456).

**An infestation of apple sucker (Psylla mali) in Nova Scotia**, W. H. BRITTAIN (*Agr. Gaz. Canada, 6 (1919), No. 9, pp. 823–827, figs. 5*).—The author records the discovery of the introduction and establishment of this European species near Wolfville, N. S., and gives an account of the nature and extent of its injury. This is said to be the first record of its occurrence in North America.

Preliminary tests as a guide for future work in the control of the pest were made after its discovery. Nicotin sulphate, 1 pint to 100 gal. of water, was applied on June 12 by means of a Friend spray gun, and in spite of the unfavorable conditions, the leaves having attained practically their full size, almost perfect results were secured. Several contact dusts were also tested for comparison with the liquid spray, the applications being made by means of the Johnson orchard duster. Nicotin sulphate was the basis of three of these dusts, it being mixed, dried, and ground with kaolin, yellow clay, and sulphur, respectively, at the rate of 2 lbs. to the hundred. Free nicotin solution combined with sulphur, using the same percentage of nicotin, was also tested, as was a mixture composed of 50 per cent of finely ground tobacco dust ground together with 25 per cent of dry lime-sulphur and 25 per cent of hydrated lime.

None of the dust mixtures gave results comparable to the liquid spray, owing to the mechanical impossibility of driving the dust into all the hiding places of the insect, due to the large size of the leaves at the time. All the dust mixtures, however, seemed to destroy the insects whenever they came in contact with them, although the green apple bug was practically unharmed.

**Spray pink and green potato aphids.** E. M. Patch (*Potato Mag., 1 (1919), No. 12, pp. 8, 9, 31, figs. 2*).—A brief summary of information on *Macrosiphum solanifolii*, in which the more recent work with remedial measures is discussed, including references to the work in Ohio by Houser et al. (E. S. R., 38, p. 462), and in Connecticut by Britton and Zappe (E. S. R., 41, p. 162.)

**On the life history and bionomics of Myzus ribis (red currant aphis).** M. D. Haviland (*Proc. Roy. Soc. Edinb., 39 (1918–19), No. 1, pp. 78–112, figs. 16*).—The studies here reported have been summarized by the author as follows:

"*M. ribis* (red currant aphis) on *Ribes rubrum* is dimorphic in respect of certain features of the antenna and of abdominal and wing dimensions. The nature of the food, whether healthy or blistered by the attack of the fundatrix, seems to be the determining factor of this dimorphism. The form from healthy leaves is probably identical with *M. whitei* and *M. dispar*.

"*M. ribis* is migratory, and in summer colonizes certain Labiatæ and other weeds; but this migration is not obligatory, and the entire life cycle may be passed on currant. On its summer host plant this species has been previously described as *Phorodon galeopsidis*.

"There is a decline in fertility in the later part of the summer among the forms remaining on currant. This is caused by a lower birthrate, and not by the shortening of the life of the parent. This decline, together with the attacks of predacious and parasitic enemies, accounts for the frequent disappearance of the species from currant in August and September.

"Both sexual forms may be produced, and eggs may be laid, on either host plant. Males transferred from Labiatæ to Ribes can fertilize the females on the latter plant."

A small braconid, *Aphidius ribis*, is its principal enemy in England.

A bibliography of 28 titles is included.

**Observations on some mealy bugs (Hemiptera; Coccidæ).** G. F. Ferris (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 292–299, figs. 3*).—The data here presented, which supplement the systematic account previously noted (E. S. R., 40, p. 262), deal largely with species which are already of economic importance or may be regarded as awaiting only a favorable opportunity to become so.

It is pointed out that the name *Pseudococcus citrophilus* given by Claassen to the so-called citrophilus mealy bug must give way, as the species was first described by Green as *P. gahani* from specimens taken from *Ribes sanguineum* in London, England. *P. maritimus* of Ehrhorn (= *P. bakeri* Essig) has been reported by Green to occur on various plants in greenhouses in England and by Chaffin from sweet potato, tomato, and avocado on the Dry Tortugas Islands, near Key West, Fla. *P. pini* is recorded from this country for the first time, having been collected on pine in a Japanese nursery at Oakland, Cal. *P. bromeliæ* appears to have become established in Florida, where specimens having been collected from the roots of bananas at Florence Villa, pineapple at Frost Proof, and citrus at Ft. Meyers. *P. virgatus*, a species previously recorded from cactus and other plants at Brownsville, Tex., has been taken from magnolia and mulberry at Gainesville, oleander at Key West, and an undetermined plant at Winter Haven, Fla. *P. comstocki*, a dangerous mealy bug originally described from specimens taken from mulberry and maple in Japan, is said to occur in the eastern part of the United States, and has been collected

from apple, horse chestnut, hydrangea, maple, mulberry, wild cherry, and some other hosts on Staten Island, N. Y., by Doane. The author states that he has also received the same species from various hosts in Maryland. A species from citrus at Ojai, while very close to *P. citri*, is apparently distinct and most closely resembles *P. kraunhiæ* from Japan.

Descriptions of *P. pini*, *P. bromeliæ*, and *P. virgatus* are given, together with the synonymy of *P. quercus*, *Lachnodius phoradendri*, and *Cryptoripersia arizonensis*.

**Lac-producing insects in the United States (Hemiptera; Coccidæ)**, G. F. FERRIS (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 330–333*).—A brief discussion of this subject, based upon a review of the literature and investigations conducted in the Southwest during the course of a trip, reference to which has been previously made (E. S. R., 41, p. 457). The author failed to find *Tachardia larreæ* to occur in sufficient quantity to be of commercial importance.

**Spray v. fumigation in the control of gray scale on citrus trees in Tulare County**, F. R. BRANN (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 3, pp. 104–107, fig. 1*).—A general discussion of the control of the gray citrus scale (*Coccus citricola* [*longulus*]), in which attention is directed to the disadvantages of spraying as compared with fumigation. It is said that fumigation with liquid hydrocyanic acid gas has advantages over all other methods.

**On the use of the names Lachnus and Lachniella**, A. C. BAKER (*Canad. Ent., 51 (1919), No. 8–9, pp. 211–212*).—The author finds *Lachnus punctatus* to be the type for Lachnus, and *Lachnus fasciatus* for Lachniella, and erects the genus Wilsonia for *Lachniella gracilis* of Wilson.

**Some observations on the webbing clothes moth (Tineola biselliella)**, M. T. SMULYAN (*Psyche, 26 (1919), No. 3, pp. 71–73*).—The data here presented supplement the information given in the paper by Benedict, previously noted (E. S. R., 38, p. 657), and confirm that author's conclusions that *T. biselliella* rather than *Tinea pellionella* is the more common species in the North.

**Some recently recorded parasites of the oriental peach moth**, L. A. STEARNS (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 347, 348*).—During investigations of this pest in Virginia 11 parasites were reared, 7 of which have not been previously recorded as attacking the oriental peach moth.

**Physiological and parasitological studies of economic Lepidoptera**, C. GAUTIER (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 19, pp. 720–723*).—Continuing work previously noted (E. S. R., 41, p. 552), notes are presented on *Apanteles glomeratus* and on the blood of a number of species of Lepidoptera.

**The striped skipper caterpillar of the coconut (Hidari irava)**, S. LEEFMANS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 35 (1919), pp. 15–31, pls. 4*).—Reports of damage by this caterpillar to coconut trees in Java, Sumatra, and Bali led to this study of its life history and parasites.

The attack of the caterpillar results in the leaves being stripped up to the big veins. From 8 to 9 days were found to be passed in the egg stage, from 32 to 37 as a caterpillar, and from 10 to 11 as pupa. Several parasites were observed, of which a tachinid and a braconid were the only ones of importance. As control measures, Paris green and lead arsenate are very efficient and do not burn the leaves.

**New Jersey's work in mosquito control**, W. E. DARNALL (*Jour. Amer. Med. Assoc., 73 (1919), No. 10, pp. 737–742, figs. 7*).—This is an address delivered before a selection of the American Medical Association in June, 1919, by the president of the Atlantic County Mosquito Extermination Commission.

**Contribution to the study of the Brazilian Trypaneidæ or fruit flies**, A. LUTZ and A. DA COSTA LIMA (*Mem. Inst. Oswaldo Cruz, 10 (1918), No. 1, pp. 5–16, pls. 2; Trans., pp. 1, 2*).—This account is based upon the specimens found in collections at the Institute of Manguinhos and of the Museum of Natural History in Sao Paulo. *Anastrepha fraterculus*, a very variable species, an account of which by Rust has been previously noted (E. S. R., 40, p. 757), is the most important form. A list is given of the species of the genus Apyrgota, subfamily Pyrgotinæ, and a description of the new species *A. personata* which might be mistaken for a Trypeta. A catalogue of the genus Anastrepha with synonyms, literature, and a bibliography follows.

**Notes on Pelenomus sulcicollis**, R. MATHESON (*Canad. Ent., 51 (1919), No. 8–9, pp. 199–201, pl. 1, fig. 1*).—The weevil here considered is said to have destroyed a small patch of fringed loosestrife (*Steironema ciliatum*) growing on the bank of a stream at Ithaca, N. Y.

**The two-colored coconut leaf beetle (Bronthispa froggatti)**, S. LEEFMANS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 35 (1919), pp. 1–14, pls. 3*).—The beetle here considered, which has not previously been recorded by Dutch entomologists, is thought to be the species which has caused serious loss in New Britain and the Solomon Islands. On the west coast of Sumatra and in west Java only plants up to four years of age are damaged by it. It is the author's opinion that the injury caused by the adults and larvæ is considerably increased by a fungus (*Pestalozzia palmarum*) which penetrates the leaf tissue through the wounds caused by this insect.

The larvæ hatch out after a period of 7 to 10 days, the pupal stage lasts from 7 to 9 days, and the beetles live under laboratory conditions from 6 to 8 months, during which period as many as 93 eggs have been recorded from a single beetle. At Padung the eggs were severely parasitized, 62 per cent being recorded.

The application of a 2 per cent solution of lead arsenate was found to be the most effective in destroying both the adults and larvæ.

**Biological notes on the flat-headed apple-tree borer (Chrysobothris femorata) and the Pacific flat-headed apple-tree borer (C. mali)**, H. E. BURKE (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 326–330*).—The author has found *C. mali* to be far more common and injurious in the Pacific States than *C. femorata*. "Numerous rearings have given us *C. femorata* from the prune and plum a few times and *C. mali* from the currant, apple, plum, prune, cherry, peach, and apricot a number of times. *C. mali* is also more common in shade trees and brush forests, while *C. femorata* is commoner in the oaks and the aspen forests of the high Sierras. *C. femorata* occurs throughout the United States, and *C. mali* has been reported from Oregon, California, Nevada, Utah, Colorado, and Arizona. Many of the published records of damages by *C. femorata* in the Rocky Mountains and the Pacific States undoubtedly refer to damage by *C. mali*."

**Notes on forest insects.—I, On two bark beetles attacking the trunks of white pine trees**, M. W. BLACKMAN (*Psyche, 26 (1919), No. 4, pp. 85–96, pl. 1, fig. 1*).—The biological observations here reported relate to *Ips longidens*, which in central New York works on the inner bark of white pine, and *Hylurgops pinifex*, which attacks white pine by preference.

**Weevils in Australian wheat in California**, R. W. DOANE (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 308–312*).—The author has found the rice weevil to be the most common beetle occurring in shipments of Australian wheat. In some lots the granary weevil was also very abundant, in other shipments but few were found.

"The saw-toothed grain beetles, *Silvanus surinamensis*, were always abundant. The confused flour beetles, *Tribolium confusum*, were common in all shipments, and *T. ferrugineum* was also often quite common. The lesser grain borer (*Rhizopertha dominica*) was always quite abundant and apparently very destructive. The flat grain beetle (*Læmophlœus minutus*) was common in all lots. The cadelle and a few other beetles were more or less common. *Mesaporus calandræ*, the cosmopolitan parasite of grain weevils, was common on nearly all lots of Australian wheat examined, and it was exceedingly abundant in some of the lots."

**A suggestion of a possible control of pea and bean weevils**, R. E. Campbell (*Jour. Econ. Ent., 12 (1919), No. 4, pp. 284–288*).—In work carried on in California the author found the percentage of infestation of broad or horse beans by the broad bean weevil ([*Bruchus*] *Laria rufimana*) to be very much less in crops from seed planted late in the season than from crops from seed planted early. While the first eggs are laid soon after the middle of March and a few may be laid as late as the middle of May, the most extensive deposition occurs during the month of April.

Data presented in tabular form show a maximum of 50 and 63 per cent of weevil infestation, and averages of 14.5 per cent for the 1916 and 1917 crops, when the seed was planted both early and late, as contrasted with a maximum of only 17.2 per cent and an average of 2.92 per cent of weevil infestation for the 1918 crop, when no seed was planted until after March 1. Many samples of the 1918 crop were entirely free from infestation, particularly those from seed planted in April and May.

**Wintering bees in Indiana**, E. G. Baldwin (*Purdue Univ., Dept. Agr. Ext. Bul. 85 (1919), pp. 2–8, figs. 2*).—A popular account.

**The European elm sawfly leaf miner**, R. N. Chrystal (*Agr. Gaz. Canada, 6 (1919), No. 8, pp. 725–728, fig. 1*).—This sawfly leaf miner (*Kaliosysphinga ulmi*), first recorded in America by Felt in 1898 as unusually destructive at Albany and Troy, N. Y., was first discovered in Canada at Kingston, Ont., in July, 1915. Recent investigations have shown the species to occur in the city of Kingston in a few localities, mainly on the Camperdown variety of Scotch elm, the American elm not being attacked.

A series of experiments by Hutchings with an allied species, the alder sawfly leaf miner (*K. dohrnii*), at the Central Experimental Farm, Ottawa, showed kerosene emulsion, 1 part of stock solution to 7 parts of water, to be effective when used at the time the larval mines were just commencing. This indicates that this remedy would also be effective against *K. ulmi*.

An account of its life history by Slingerland in 1905 has been noted (E. S. R., 17, p. 680), as has been an account by Herrick in 1913 on its control (E. S. R., 29, p. 556).

**Euura laeta in Sweden**, A. Tullgren (*K. Landtbr. Akad. Handl. och Tidskr., 58 (1919), No. 2, pp. 59–68, figs. 9; also in Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 180 (1919), pp. 12, figs. 9*).—A brief account of this small gall-making sawfly, which is a source of injury to *Salix viminalis*.

**The mason wasps**, J. H. Fabre, trans. by A. Teixeira de Mattos (*New York: Dodd, Mead & Co., 1919, pp. [VIII]+318*).—A translation of the author's Souvenirs Entomologiques treating of wasps. This work, which comprises the second of a series dealing with wasps (E. S. R., 35, p. 468), takes up the Eumenes, Odyneri, Pelopæus, Ageniæ, Volucella, etc.

**Mites affecting the poison oak**, H. E. Ewing (*Proc. Iowa Acad. Sci., 24 (1917), pp. 323–326, fig. 1*).—The author here describes a new gall mite (*Phyllocoptes toxicophagus*) from Oregon, which so far as known is restricted to a

Pacific slope species of poison ivy (*Rhus diversiloba*). He also records the feeding of the spider mite (*Tetranychus telarius*) on poison ivy in the vicinity of Corvallis, Oreg., likewise a leaf roller.

## FOODS—HUMAN NUTRITION.

**A biometric study of basal metabolism in man, J. A. HARRIS and F. G. BENEDICT** (*Carnegie Inst. Wash. Pub. 279 (1919), pp. VI+266, figs. 30*).—The purpose of this study is expressed by the authors as "to present the results of a first attempt to analyze the data of basal metabolism in normal men and women by the higher statistical or biometric formulas."

The unfamiliarity of most physiologists with biometric methods and the relative paucity of data on basal metabolism are believed to be responsible for the slowness with which the higher statistical methods have been applied to this field of research. The data accumulated from experiments on basal metabolism in the Nutrition Laboratory of the Carnegie Institution now comprise those for age, body weight, pulse rate, and gaseous exchange, together with computed heat production for 136 male and 103 female adults, and represent a non-negligible contribution to the problem of human metabolism. They are here statistically analyzed by biometric methods, the principles underlying the establishment on them of standard basal metabolism constants are discussed, and standard multiple prediction tables for normal basal metabolism are worked out. These tables are based on the factor of body weight, with correction factors for age and stature, and are given for men and women separately. The authors summarize the plan and significance of the study as "to emphasize the necessity for the establishment of statistical normal basal metabolism standards, which may serve as a basis of comparison in all special nutritional investigations; to supply convenient tables of such standards based on the most extensive series of normal data as yet available; to illustrate the practical use of such tables in the solution of problems in nutritional physiology."

"Biologically the most rational and practically the most satisfactory standard is that secured by taking into account the body weight, stature, and age of the subject in predicting basal metabolism. This method is therefore an extension and modification of the selected-group method, employed earlier at the Nutrition Laboratory. In the new method, which we have designated as the multiple-prediction method [the authors], replace the empirical determinations of the metabolism of individuals of specific weight, stature, and age by values given by multiple-prediction equations based on the statistical constants of all available normal data. These equations have been tabled for both men and women for a range of weight, stature, and age which will be met in practical work with adult subjects, and give a set of multiple-prediction tables of standard normal adult basal metabolism constants.

"The illustrations of the practical application of these multiple-prediction tables show first of all their great usefulness in the detection of differences between series of metabolism measurements. Thus, as far as [the authors] are aware, the anomalous nature of the series of determinations by Magnus-Levy and Falk and those by Palmer, Means, and Gamble has heretofore quite escaped the notice of physiologists, and their data have been combined freely with other series for the purpose of generalization. The aberrant nature of these series becomes evident as soon as comparison of the actual measurements with the theoretical values from the multiple-prediction tables is made.

"The use of the tables shows the clear differentiation of athletes and diabetics from other individuals in their metabolic level, thus confirming conclusions already drawn at the Nutrition Laboratory.

"The use of the standards shows the existence of a well-marked differentiation in the level of metabolism of men and women, and shows that the differences are persistent throughout adult life instead of disappearing in later years as maintained by Sondén and Tigerstedt. There is no evidence for such differentiation in new-born infants.

"While the novelty of the conception underlying these standards will probably limit somewhat their immediate adoption by physiologists, the illustrations show that for purposes of more refined analysis they have great practical value. We believe that ultimately the great convenience of these multiple-prediction tables will result in their general adoption as standards of reference in all work on human nutritional physiology.

"When larger series of basal data are available we expect to revise these tables so that they may represent the broadest and most secure foundation for comparative nutritional investigation."

**Report on the metabolism of female munition workers**, M. Greenwood, C. Hodson, and A. E. Tebb (*Proc. Roy. Soc. [London], Ser. B, 91 (1919), No. B 635, pp. 62–82*).—This detailed report consists of a general description of the factory conditions and of the salient features of individual processes studied, a criticism of the results from the experimental point of view, a summarized interpretation of the data obtained, and a brief discussion of the economic implications of these results. The metabolism was determined by indirect calorimetry, the respiration apparatus used being a modification of the Douglas bag combined with a face mask.

A study of the detailed tables shows that in a majority of the operations the range of variation from subject to subject is very great, due either to the individual peculiarities of metabolism or to great variations in the amount of physical work actually performed during the experimental periods, or to both factors. A provisional grouping of the figures on the basis of the general means is given as follows:

(1) Light turning, turning, and forging requiring about 100 calories per square meter per hour; (2) tool setting, heavy turning, stamping, finishing copper bands, and shell hoisting, all needing about 125 calories; (3) gauging, walking, and carrying, requiring 160 calories; and (4) laboring, and cleaning and drying, requiring 180 calories per square meter per hour. With these figures as a basis the average daily food requirement for the four classes is calculated as 2,810, 3,120, 3,555, and 3,805 calories, respectively.

Attention is called to the fact that while the energy requirement of the lightest class is about 74 per cent of the heaviest, the remuneration of the kinds of work included in the heaviest class has been much less than that of several operations needing decidedly fewer calories. The importance is emphasized of taking into account the physiological element of working-class expenditure.

**Preparation of protein free from water-soluble vitamin**, T. B. Osborne, A. J. Wakeman, and E. L. Ferry (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 35–46, pl. 1*).—This paper reports the results of a study of the relative efficiency of the various methods used to remove the water-soluble vitamin from preparations of different proteins, as determined by comparing the length of life or rate of decline of young rats fed on diets containing the protein under examination, together with a basal ration supposedly free from water-soluble vitamin. The proteins selected represented a wide variety in chemical constitution and in methods of extraction and purification.

On the diets containing lactalbumin, gliadin, ovovitellin, pure or crude casein, or meat residue, nearly all the rats lost from 30 to 40 per cent or more in weight, and all but one died within 50 days unless water-soluble vitamin was supplied. The prompt recovery on the administration of yeast demonstrated a lack of water-soluble vitamin in the proteins employed. On diets containing crude edestin or cottonseed globulin rats were maintained for three months without notable change in body weight, and when the amount of protein was doubled all but one gained weight fairly rapidly. Evidence of a decided lack of water-soluble vitamin in edestin was obtained only after the edestin had been purified by seven recrystallizations. The suggestion is made that the persistence with which the water-soluble vitamin is retained by edestin may be due to a chemical combination therewith, and that in this respect the vitamin resembles acids which combine with edestin to form salts. Similarly the ease with which the vitamin is separated from casein and from ovovitellin may be due to the acid character of these proteins, which would render them incapable of entering into chemical combination with the vitamin, provided the latter has acid properties. The absence of the vitamin from preparations of gliadin and of meat residue is ascribed to the small amounts of the vitamin in the original substances.

In conclusion, the authors emphasize the importance of proving a diet to be free from the water-soluble vitamin before considering it suitable for use in feeding experiments designed to show the proportion of this vitamin in any other element of food.

**Nutritive factors in plant tissues.—II, The distribution of water-soluble vitamin,** T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 29–34, figs. 2*).—In continuation of previous work (E. S. R., 39, p. 665), a preliminary report is given of the distribution of the water-soluble vitamin in plant tissues. To the list of plant tissues in which it has previously been found, the authors now add the bulb of the onion, the root of the turnip, the leaves, stems, and root of the beet, and the fruit of the tomato.

To permit more accurate comparison of the water-soluble vitamin content of natural foods, a procedure has been adopted which consists in feeding each day small known quantities of the vegetable product under investigation apart from the basal ration which is fed ad libitum. This method has been applied to a study of the effect of the maturity of plants upon their vitamin content, and it has been found that hay made from immature plants of clover, alfalfa, and timothy is much more efficient as a source of water-soluble vitamin than the hay prepared from mature specimens. The fact that such a difference exists is thought to have importance in feeding young animals and dairy cows, and the possible advisability is suggested of using hay made from immature clover or alfalfa to replace part, at least, of the milk fed to young stock and to replace entirely the hay ordinarily used for dairy cows.

**Accessory factors in food,** F. G. HOPKINS and H. CHICK (*Lancet [London], 1919, II, No. 1, pp. 28, 29*).—This memorandum has been issued by the committee on accessory food factors appointed by the Medical Research Committee and the Lister Institute (England) for the guidance of those engaged in the administration of food relief to famine-stricken districts. The accessory food factors are classified as the antineuritic or antiberiberi factor identified with the water-soluble B growth factor, the fat-soluble A growth factor or antirachitic factor, and the antiscorbutic factor. A brief description is given of the distribution and properties of these factors, with an accompanying table showing their distribution in the common foodstuffs, followed by a discussion of the practical application of the facts presented to the prevention of diseases.

**The hydrogen-ion concentration of foods**, J. F. McClendon and P. F. Sharp (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 531–534*).—From a series of determinations of the H-ion concentration of foods, the analytical data of most of which are not presented, the authors report that the foods "were all on the acid side of neutrality no matter what the condition of freshness, mode of storage, stage in the preparation (cooking), or dilution with water (extract, soup, or pot liquor)."

A table is given of the pH of the juice of fruits and vegetables (young carrot, potato, cabbage, orange, and lemon) in the raw state and after boiling. The differences between the pH of the raw and cooked product were very slight.

**Efficiency of oat protein in adult human nutrition**, H. C. Sherman, J. C. Winters, and V. Phillips (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 53–62*).—This investigation was conducted under conditions similar to those described in the previously noted study of the efficiency of maize proteins (E. S. R., 39, p. 873). One of the two subjects in the present study served as subject in the earlier investigations, and the diet was selected to conform as closely as possible to that of the previous study with the substitution for the corn of an amount of oatmeal furnishing the same amount of nitrogen.

In the main experiments of 12 days each the two subjects, receiving only sufficient calories to meet the energy requirement and but 0.57 or 0.55 gm. of protein per kilogram of body weight (furnished by oatmeal +100 gm. of milk), showed, respectively, nitrogen balances of ±0.0 and +0.2 gm. per day as compared with a nitrogen balance of ±0.1 gm. per day on the maize protein diet. The nitrogen balances during 12 days on the oat diet without milk and 8 days on the comparable maize diet without milk were, respectively, —0.7 and —0.6 gm. per day.

The authors conclude "that for the purpose of practical dietetics equal weights of oat and maize proteins may be regarded as essentially equal in value, and that even the minimum amount of milk which can possibly be regarded as permissible in the light of our present knowledge of nutrition will apparently so supplement the proteins of either the maize or oat kernel as to make them function with an efficiency comparable with that of the average protein of mixed diet in the maintenance metabolism of man."

**[Miscellaneous food and drug topics]**, E. F. Ladd and A. K. Johnson (*North Dakota Sta. Spec. Bul., 5 (1919), No. 12, pp. 258–277, figs. 7*).—This number contains brief notes on several food and drug topics. Data showing the variation in weight per box of strawberries are reported by F. C. Himber, together with the text of the State law of February 14, 1919, as to containers for small fruits. An article by W. G. Bowers on The Chemical Analysis of a Few Food Preparations Compared to the Claims on the Labels, presents analyses and discussions of several proprietary pie fillings, a baking powder, and two canned boiled dinners.

**The restricted rations of prisoners of war in Germany considered from the point of view of the minimum of nitrogen**, A. Benoit (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 4, pp. 151–153*).—Observations are reported of the effects of a restricted diet upon 78 Russian officers in a German prison from June, 1915, to October, 1916. The observations included determinations of total and nitrogen intake, nitrogen excretion, and changes in weight of each subject.

The diet furnished a daily average per man of 48.7 gm. of protein, 332 gm. of carbohydrate, 48.7 gm. of fats, and 1,704 calories, or 27 calories per kilogram of body weight. During the period of 16 months in which observations were made none of the prisoners presented any evidence of nutritive disorders, and the average individual loss in weight was only about 140 gm.

That no appreciable trouble was caused by the restricted amount of nitrogen is attributed by the author apparently to the successful distribution of the protein of the ration from the point of view of the various constituents of the protein molecule. It was estimated that of 100 gm. of protein ingested, 49 gm. was in the form of gliadin-glutenin (bread and flour), 23.3 as casein and milk albumin (cheese), 16.3 as various animal proteins (meat and fish), and 11.5 as vegetable proteins (beets and potatoes). It is pointed out that in spite of the meagerness of the diet none of the indispensable amino acids were missing.

**Studies on the behavior of inulin in the animal body.—II, Inulin in the alimentary canal,** R. OKEY (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 149–162, figs. 2*).—This paper is a continuation of the investigation previously noted (E. S. R., 41, p. 12). The study of the behavior of inulin in the alimentary canal deals with (1) the hydrolysis of inulin in vitro by concentrations of hydrochloric acid comparable to those in normal gastric juice, (2) the action of gastric juice on inulin in vivo, and (3) the demonstration of the presence of an inulase in fecal extracts.

The results of hydrolysis of inulin in vivo and in vitro indicate that, while the acidity of the gastric juice is usually sufficient to produce a fair degree of hydrolysis, inulin is seldom retained in the stomach long enough to be changed to levulose. The presence of an enzym capable of producing a reducing sugar from inulin was demonstrated in sterile extracts of three samples of human feces from radically different diets. The marked gas formation which always follows inulin digestion is thought to indicate that further decomposition of the reducing sugar thus formed takes place so rapidly that appreciable absorption is impossible.

**Studies of the gastric residuum.—III, Amino-acid nitrogen,** R. CESSNA and C. C. FOWLER (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 25–28*).—In continuation of the studies by Fowler previously noted (E. S. R., 39, p. 670), determinations are reported of the amino-acid nitrogen content of the gastric residuums of 25 apparently normal young women and one apparently normal man. For purposes of comparison the total and free acidity, pepsin, and trypsin were also determined.

The amount of amino-acid nitrogen was in all cases higher than the values reported by Carlson[1] and other observers, the average content being 31.86 mg. per 100 cc. The amount apparently bears no relationship to acidity or pepsin or trypsin content.

**The amount of fat and lipoid in the blood in the Tropics** (*Meded. Geneesk. Lab. Weltevreden [Dutch East Indies], 3. Ser. A, No. 2–3 (1919), pp. 29–67, pl. 1*).—Two papers are presented.

I. *Chemical analysis*, by F. and E. Weehuizen and C. Alting (pp. 29–43).—The authors discuss Bang's micro method for determination of blood lipoids (E. S. R., 41, p. 116) and propose certain modifications in the process.

II. *Physiological chemical part*, by C. D. de Langen and H. Schut (pp. 44–67).—Analytical data based on determinations by the method noted above are presented of the fat and lipoid content of blood of normal persons and those suffering from various diseases, including beriberi. The amount of total fat found in the blood of normal persons varied between 1.5 and 2 per cent. In fever-free malaria patients and in tuberculous patients the figures for fat approached the higher level, while in cases of beriberi the amount of fat was very low.

The authors suggest the possible influence of the lipochrome lutein on beriberi, pointing out that in patients with beriberi the amount of lutein is gen-

[1] Amer. Jour. Physiol., 38 (1915), No. 2, 248–268.

erally very low and that animal and vegetable substances which have a high antiberiberi value are all derived from organs which contain many lipochromes.

**Effect of diet on the alkaline reserve of the blood,** J. F. McClendon, L. von Meysenbug, O. J. Engstrand, and F. King (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 539–548, figs. 3*).—Determinations of the alkaline reserve of the blood, as represented by the bicarbonate concentration of the plasma on the basis of a normal solution of sodium bicarbonate, were made on a man of 75 kg. (165 lbs.) body weight who was placed on an acid-forming diet for 3 days, then on a mixed diet for 3 days, and finally on a base-forming diet for 3 days.

The results, as well as similar results obtained with dogs, show that the alkaline reserve is not appreciably changed by a change in diet. The rabbit was found to be more susceptible to the effects of diet and fasting.

The authors conclude that "there is no foundation for the view that the alkaline reserve of man is endangered by acid-forming diets, but such diets as usually eaten are deficient in antiscorbutic substances."

An improved form of titration electrode is described and illustrated.

**Factors influencing the hydrogen-ion concentration of the ileum,** J. F. McClendon, F. J. Myers, L. C. Culligan, and C. S. Gydesen (*Jour. Biol. Chem., 38 (1919), No. 3, pp. 535–538*).—Data are presented to show that the length of the ileum is an important factor in determining its H-ion concentration. The shorter the intestine with reference to the length of the body the higher is its acidity. As the gastric juice mingles with pancreatic secretion in the duodenum a large amount of carbon dioxid is produced, more of which is absorbed the longer the intestine.

**Food conditions and nutritional diseases in Europe; with some remarks on the etiology of pellagra,** S. Harris (*Med. Rec. [N. Y.], 96 (1919), No. 3, pp. 89–95*).—This paper presents the results of observations in France, Italy, Austria and Hungary, Germany, and Belgium during the war of the effect of food conditions upon disease, with particular reference to pellagra.

The author points out that with much the same food conditions in a number of European countries that exist among the poor in the rural districts in the South there has apparently been little pellagra. In Italy this disease has even decreased during the war. The inference is drawn that perhaps some other etiological factor than the unbalanced diet is responsible for pellagra, and the suggestion is made that the disease is possibly due to an organism which may be discovered by studying the blood, tissues, and excretions of pellagrins with the dark field microscope.

**Experimental mammalian polyneuritis produced by a deficient diet,** C. Voegtlin and G. C. Lake (*Amer. Jour. Physiol., 47 (1919), No. 4, pp. 558–589, figs. 18*).—An extensive investigation is reported, the purpose of which was to produce deficiency polyneuritis in mammals, which could be used to better advantage than pigeons in studies on experimental polyneuritis and the physiological function of the antineuritic vitamin.

Experimental evidence, as indicated by the symptomatology, treatment, and pathology of the disease is reported, proving that polyneuritis has been produced in cats and dogs as the result of an exclusive dietary of lean beef which had been heated for three hours at 120° C. in the presence of an alkali, sodium carbonate. The disease was shown to be due to a deficiency of the diet in antineuritic substance and not in other essentials (amino acids, fat-soluble vitamin, etc.). Similar treatment of the beef without the previous addition of alkali did not completely destroy its antineuritic power, indicating that the ordinary preparation of meat for human consumption does not lessen its food value in that respect.

Cats were found to respond to the deficient diet with the greatest regularity, and are therefore considered best adapted for physiological studies of the antineuritic vitamin.

**Vitamin studies.—IV, Antineuritic properties of certain physiological stimulants,** R. A. DUTCHER (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 63–68*).—In continuation of the previously noted vitamin studies conducted at the Minnesota Experiment Station (E. S. R., 40, p. 563), prelimnary work is reported on an attempt to discover substances whose physiological action has been studied which will bring about a physiological response in polyneuritic pigeons similar to that of the vitamin extracts.

The administration of thyroxin, desiccated thyroid gland, pilocarpin hydrochlorid, and tethelin apparently produced definite relief from paralytic symptoms in acute cases of avian polyneuritis, but in no case was the response as rapid as when vitamin preparations were fed. This is thought to be due perhaps to the fact that the vitamin preparations contain, in addition to the so-called vitamin, phosphorus, sulphur, and organic compounds needed for the repair and building of tissue.

The study is being extended to other chemical substances.

## ANIMAL PRODUCTION.

**Experimental studies on growth.—IX, The influence of tethelin upon the early growth of the white mouse,** T. B. ROBERTSON and M. DELPRAT (*Jour. Biol. Chem., 31 (1917), No. 3, pp. 567–574, fig. 1*).—This paper continues a series of experimental studies (E. S. R., 36, p. 366), and summarizes the growth records of 60 litters of white mice for the first 49 days after birth.

Tethelin, a lipoid extracted from the anterior lobe of the pituitary body, was fed to the mothers of one group of litters but was apparently not secreted by the mammary gland, as no effect on growth was detected. When it was mixed with the feed eaten by the young after their eyes had opened (at the age of 14 days), a marked acceleration of growth occurred during the period designated by Robertson as the second growth cycle (second to fifth week). This was followed by a definite retardation during the third cycle, similar to that found in Study IV (E. S. R., 35, p. 865), when tethelin feeding was begun at the end of the second cycle. The retardation occurred even though the administration of tethelin had been discontinued at the end of the fifth week.

**Experimental studies on growth, X–XIV,** T. B. ROBERTSON and L. A. RAY (*Jour. Biol. Chem., 37 (1919), No. 3, pp. 377–463, figs. 25*).—The five papers listed below are added to this series of reports. Studies X, XI, and XIV deal with the body weights of white mice at successive ages, and include tables which give, by weeks to the age of 30 weeks and fortnightly thereafter, the following data for each group of experimental or normal (control) animals considered: (1) The number weighed, (2) the average weight, (3) the difference between the latter and the average at the corresponding age of the normal with which it is compared, (4) the ratio of this difference to its probabl error, and (5) the percentage variability of the weights composing the average. The average weights of each group are also presented graphically as the ordinates of growth curves.

X. *The late growth and senescence of the normal white mouse, and the progressive alteration of the normal growth curve due to inbreeding* (pp. 377–391).—Amplifying the growth records of Study II (E. S. R., 35, p. 864), the authors first summarize the complete series of weights of the two earliest groups of normals used in their experiments, the males and females born in July, 1914. The records cover the ages from 4 to 150 weeks, i. e., until the death of all the mice.

"The average weight of animals of both sexes increases, with a continuously decreasing velocity, to a definite maximum, attained at about 91 weeks of age in the male and at about 94 weeks of age in the female. After attaining this maximum the [growth] curve descends rather steeply, the loss of weight being much more rapid than the immediately preceding gain. This loss of weight is the expression of senescence, and continues without interruption until the decease of the last surviving animal. . . .

"The average duration of life (110 weeks in the male, 103 weeks in the female) exceeds by a definite interval the period during which the weight of the animals is increasing. The attainment of the average duration of life is therefore preceded by a decided measure of senescence which must consequently have affected the viability of the majority of the animals and played a leading part in determining the mean duration of life."

The rest of the paper presents similar data for two groups of males and two of females born at later dates. Each group is compared with its predecessor of the same sex. The intervals between the birth dates were, respectively, 4 and 20 months in the case of the males, and 24 and 15 months in the case of the females. Having due regard to the probable errors of the differences, these data "reveal a regularly diminishing velocity and absolute magnitude of growth in each succeeding batch of animals." The differences were more marked between the first and second than between the second and third groups of each sex, and this is held to indicate an approach to a stable type. The decrease in size and rate of growth is attributed to inbreeding, which was unavoidable since new strains have not been introduced.

XI. *The growth and senescence of white mice fed upon pituitary (anterior lobe) tissue, tethelin, egg lecithin, or cholesterol* (pp. 393–426).—The growth data presented in Studies III to VI (E. S. R., 35, pp. 865, 866) are extended to cover the later periods of life so that the tables now published are complete from the first weights at the age of 4 or 5 weeks to the time of death of the last survivor. In the course of the four experiments ox pituitary, tethelin, "lecithin" (ether extract of egg yolk precipitated once with acetone), and cholesterol were each fed to a particular group of males and a particular group of females that received in addition a normal mixed diet. A definite amount of each substance was given daily throughout life except in the case of the tethelin female group, where the administration was intermittent and ceased before maturity.

"In all the growth curves senescent loss of weight precedes by a definite interval the average duration of life, and the terminal oscillations of the curve reveal successively steeper descending limbs, showing that senescent loss of tissue is proceeding with augmenting velocity as age increases. The position of the maximum of the growth curve is, however, considerably affected by the administration, and almost disappears in the curve of the tethelin males (which received tethelin continuously) and in the curves of the lecithin-fed animals. The hump of the normal curve is replaced in these cases by a long, flattened plateau, gradually rising (tethelin males) or falling (lecithin males and females) till the relatively rapid fall due to senescence supervenes. It is probably significant that the greatest flattening of the curve (i. e., slowing of the rate of change of growth velocity) occurred in precisely those groups of animals which displayed the greatest duration of life (tethelin males), or else in which certain exceptional individuals displayed a remarkably enhanced duration of life (lecithin males)."

XII. *The influence of pituitary gland (anterior lobe) tissue, tethelin, egg lecithin, and cholesterol upon the duration of life of the white mouse* (pp. 427–

442).—This paper deals with the age at death of those mice in the authors' experiments which reached adult life (age of 210 days). In the case of the groups of animals fed either pituitary tissue, lecithin, or cholesterol, the deviations of the average length of life from the average of normal adults were found not to be much, if any, greater than the probable errors of the differences. However, the males fed tethelin lived on the average 99 days (13 per cent) longer than normal males, and the females which had received tethelin lived 81 days (11 per cent) longer than the control females.

XIII. *Lesions exhibited by normal, pituitary-, lecithin-, cholesterol-, and tethelin-fed white mice at the occurrence of natural death, with especial reference to the incidence and development of spontaneous cancer* (pp. 443–453).

XIV. *Further experiments on the influence of tethelin upon the growth of the white mouse* (pp. 455–463).—Report is made of the first 50 weeks' growth of 48 female mice (born in 1916) fed tethelin in daily doses continuously, and of the first 30 weeks' growth of 24 females (1916) and 22 males (1917) fed tethelin from the fourth to the twelfth week of life only.

All three groups showed the characteristic retardation in the adolescent stage which normally is the period of most rapid growth. The curve of the continuously-fed group remained below the normal curve until late in life, when the postponement of senescence typical of tethelin feeding caused the curve to meet the descending normal curve. The other two groups after the administration of tethelin had ceased shot rapidly above the normal, and remained above throughout the period under consideration. This acceleration, already noted to a much less marked degree in the two tethelin groups of Study IV, is not attributed to the tethelin directly, but to "compensatory factors which develop in the animal itself in response to the abnormal dosage of the active principle of the anterior lobe of the pituitary body." It is stated that some exceptionally large animals have been secured as the result of brief periods of tethelin feeding.

**The growth of the ovarian follicle of the guinea pig under normal and pathological conditions**, L. S. N. WALSH (*Jour. Expt. Med., 26 (1917), No. 2, pp. 245–261, figs. 2*).—The ovaries of 6 guinea pigs were cut into serial sections, and the percentage of granulosa cells in the process of mitosis was determined for a number of normal follicles in different stages of growth.

In small follicles (averaging 215 by 130$\mu$) 0.66 per cent of the cells were dividing, in medium sized follicles (506 by 450$\mu$) 1.2 per cent, in large follicles (788 by 611$\mu$) 0.73 per cent, and in fully mature follicles (930 by 629$\mu$) 0.06 per cent. About 220,000 cells were examined in making these determinations. It is held that the growth energy is at its maximum in medium-sized follicles. Most of the cell divisions were observed in the vicinity of the ovum.

The extent of cell division in atretic follicles and in follicles of ovaries which were not functioning normally was also studied. The proliferative power of living granulosa cells is apparently reduced during the atresia which follows ovulation.

**Live stock breeding**, P. P. VAN DER POEL (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1916, pp. 291–333*).—Information is provided as to the live stock interests of Java and Madura, Sumatra, Celebes, the Dutch possessions in Borneo and most of the lesser East Indian Islands, but not of New Guinea and the Molukka Islands, together with statistics of imports and exports, the numbers of cattle and buffalo slaughtered for meat, and the distribution of dairy cattle according to breed and locality.

**Famous Angus cows of Scotland**, H. W. MUMFORD (*Breeder's Gaz., 76 (1919), No. 11, pp. 462, 463*).—The author selects five Aberdeen-Angus cows, Erica,

Pride of Invershie, Elba, Jilt, and Pride of Aberdeen, for special mention on account of the noteworthy qualities of their descendants.

Determining the age of cattle by the teeth, G. W. POPE (*U. S. Dept. Agr., Farmers' Bul. 1066 (1919), pp. 4, figs. 6*).—A series of cuts is given showing the appearance of the internal face of the incisors of cattle shortly after birth and at the ages of 2, 3, 4, 5, and 12 years. There is a brief explanatory text.

The availability of the energy of food for growth, C. R. MOULTON (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 389–394*).—To study the utilization for beef production of metabolizable energy derived from the feed and not needed for maintenance, two mature beef steers at the Missouri Experiment Station were fattened immediately after they had been subjected to a prolonged maintenance trial in a thin condition. The feeds offered—corn chop and linseed meal (8:1), and alfalfa hay to the extent of 40 per cent of the grain ration—were the same in kind and proportion as during maintenance. The data from a digestion experiment with these feeds and the maintenance trial have been published (E. S. R., 33, p. 569), the animals being included in the "regular-maintenance" group. In estimating the energy requirement for maintenance from the results for the thin steer it was assumed that the energy required is propotional to the five-ninths power of the body weight, in accordance with previous determinations of the author (E. S. R., 35, p. 64). The metabolizable energy of the feed was computed from the chemical composition by the Armsby method and was found to be 1.72 therms per pound of digestible organic nutrients.

One steer (No. 121) was slaughtered when in full prime condition and the other (No. 48) when 40 to 50 days under prime. Proximate analyses were made of the dressed carcasses. A third steer (No. 18) which had also been on the maintenance trial, was slaughtered at the beginning of the fattening period. The percentage composition of its carcass was taken as the initial percentge composition of the other two steers, and in this way the chemical constitution of the gains made by the latter are estimated. It was assumed, using average data of other workers, that the thermal equivalents of the protein and of the fat in the gains were respectively 5.6776 and 9.4889 calories per gram.

The main results are assembled in the following table:

*Recovery of available energy in fattening steers.*

| Steer No. | Condition at slaughter. | Initial weight. | Feeding period. | Gain in dressed carcass. | Protein in gain. | Fat in gain. | Metabolizable energy. | | Energy recovered. | | Proportion of available energy recovered. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Used for maintenance. | Available for gain. | In protein gained. | In fat gained. | |
| | | *Lbs.* | *Days.* | *Kg.* | *P. ct.* | *P. ct.* | *Therms.* | *Therms.* | *Therms.* | *Therms.* | *P. ct.* |
| 121 | Medium | 764 | 153 | 212 | 11.8 | 46.1 | 1,900 | 2,000 | 141 | 926 | 53.4 |
| 48 | Prime | 842 | 567 | 418 | 8.5 | 59.4 | 8,646 | 4,873 | 293 | 2,356 | 52.5 |

It is pointed out that about the same proportion of the available energy was recovered in both the very fat and the medium fat steer. The former, however, had 5.06 therms while the latter had only 3.98 therms available for each pound of gain, a difference explained by the higher proportion of fats in the gains of the latter.

It is estimated that if the grain and alfalfa hay of Armsby and Fries' experiments (E. S. R., 33, p. 72) had been fed in the same proportions as in those

reported by the authors, about 55 per cent of the available energy would have been utilized. Compared with the author's average of about 53 per cent, "this is a remarkably close agreement, and is an experimental verification of the work done by Armsby in his calorimeter."

Supplementary feeds in fattening lambs, H. J. GRAMLICH (*Nebraska Sta. Bul. 173 (1919), pp. 24, figs. 8*).—A feeding experiment beginning December 30, 1915, with 308 Wyoming lambs divided into 11 lots is reported. A preliminary account of certain results has been noted (E. S. R., 38, p. 271). In one lot (lot 8) the lambs received corn and linseed meal in a self-feeder, were allowed all the prairie hay they would eat, and were marketed in 40 days. The other lots were all hand fed, received alfalfa hay ad libitum, and were marketed in 75 days, all at the same selling price. Three lots were used in testing heavy, medium, and light corn feeding without other concentrates, and 3 in comparing linseed meal, cottonseed meal, and cold-pressed cottonseed cake when fed in definite amounts with such corn and alfalfa as would be consumed. The main results from these 6 lots are tabulated below.

*Lamb feeding, 1915–16. Value of limiting corn rations and comparison of supplements.*

| Lot. | Corn ration per head. | Supplement fed. | Nutritive ratio. | Initial weight per head. | Daily gain per head. | Feed consumed per pound of gain. | | | Cost per pound of gain. | Profit per head. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Shelled corn. | Supplement. | Alfalfa hay. | | |
| | *Lbs.* | | | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Cents.* | |
| 1 | 1.33 | None | 1 : 6.6 | 60.3 | 0.337 | 3.94 | ..... | 2.99 | 5.53 | $2.13 |
| 2 | .86 | .....do..... | 1 : 5.4 | 60.9 | .329 | 2.60 | ..... | 4.99 | 4.90 | 2.27 |
| 3 | .72 | .....do..... | 1 : 5.2 | 60.9 | .298 | 2.42 | ..... | 5.58 | 4.94 | 2.12 |
| 5 | 1.22 | Linseed meal | 1 : 5.3 | 61.3 | .407 | 2.99 | 0.535 | 2.65 | 5.43 | 2.48 |
| 6 | 1.29 | Cottonseed meal | 1 : 5.0 | 59.7 | .437 | 2.96 | .517 | 2.45 | 5.15 | 2.65 |
| 7 | 1.22 | Cottonseed cake | 1 : 5.4 | 59.1 | .430 | 2.84 | .748 | 2.41 | 5.18 | 2.60 |

Shelled corn was charged at 60 cts. per bushel and alfalfa hay at $8.50 a ton. The price per ton charged for linseed meal was $40, for cottonseed meal $35, and for cold-pressed cake $29. The relative profits are influenced slightly by the fact that the initial costs for lambs varied from lot to lot.

It is pointed out that a medium corn ration under the conditions was more economical than a heavy or a light ration.

With regard to the supplements, it is estimated that $53 could have been paid for linseed meal, $55 for cottonseed meal, and $41.50 for cottonseed cake without reducing the profits from lots 5, 6, and 7, below the lot 1 profit.

Lot 4, in addition to alfalfa and a full feed of shelled corn, was given a daily corn-silage ration which was gradually reduced from 2 lbs. per head at the beginning to 0.5 lb. at the end of the test. The average daily gain was 0.388 lb. The silage consumed per pound of gain was 3.93 lbs., this amount replacing 0.74 lb. of the corn and 1.4 lb. of the alfalfa required by lot 1 for a pound of gain. With silage at $4 a ton, the cost of gain was 4.95 cts. a pound and the profit per lamb $2.52.

Lot 9 was treated like lot 1 except that hominy feed was substituted for corn. To make a pound of gain these lambs required 3.57 lbs. of hominy feed and 3.01 lbs. of alfalfa, at a cost of 5.78 cents, with hominy feed at $25 a ton. The daily gain was 0.36 lb. per head and the profit about equal to that of lot 1. It is pointed out that with hominy feed and corn priced the same, the former would have been distinctly more profitable.

Sliced sugar beets were added to the corn and alfalfa ration of lot 10. The daily gain was 0.366 lb. per head. Compared with the results of lot 1, 2.98 lbs. of beets took the place of 0.5 lb. of corn and 0.38 lb. of alfalfa in producing a pound of gain and reduced the cost 0.08 ct. if the beets are valued at $4 a ton.

Lot 11 (corn and alfalfa hay) was fed in the open, whereas the other lots were all under shelter. The corn consumption per unit gain was the same as in lot 1; the alfalfa consumption was 0.14 lb. less.

Lot 8 (self feeder) made an average daily gain of 0.5 lb. per head for the 40 days of the test and consumed 2.65 lbs. of corn, 2.09 lbs. of linseed meal, and 0.7 lb. of prairie hay per pound of gain, at a cost of 7.34 cts. The charge for prairie hay is not indicated. Unless a high finish is required in a short time, this method of feeding is not recommended.

A table is included showing the changes in cost of gains of each lot with changes in the prices of the feeding stuffs used.

**Ninety-five-day lamb feeding experiment, November 23, 1916, to February 25, 1917** (*Bul. Nebr. Bd. Agr., No. 245 (1918), pp. 353–357*).—Eight lots of 27 Wyoming lambs and one of 26 were fed at the Nebraska Experiment Station. Lots numbered 1 to 8 were intended as duplicates of the lots bearing corresponding numbers in the preceding winter's experiment noted above. A selling price was assigned to each lot according to the finish. The results from the tests of limited corn feeding and from the comparisons of protein supplements may be summarized as follows:

*Lamb feeding, 1916–17. Value of limiting corn rations anr comparison of supplements.*

| Lot. | Corn ration per head. | Supplement fed. | Initial weight per head. | Daily gain per head. | Feed consumed per pound gain. | | | Cost per pound of gain. | Selling prices per pound. | Profit per head. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Shelled corn. | Supplement. | Alfalfa hay. | | | |
| | *Lbs.* | | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Cents.* | *Cents.* | |
| 1 | 1.32 | None | 53.2 | 0.397 | 3.32 | ..... | 3.30 | 6.64 | 13.90 | $3.55 |
| 2 | 1.09 | .....do | 53.9 | .356 | 3.06 | ..... | 3.93 | 6.56 | 13.75 | 3.18 |
| 3 | .84 | .....do | 54.7 | .299 | 2.81 | ..... | 4.72 | 6.57 | 13.75 | 2.82 |
| 5 | 1.09 | Linseed meal | 52.6 | .420 | 2.60 | 0.81 | 3.17 | 7.30 | 14.05 | 3.53 |
| 6 | 1.09 | Cottonseed meal | 53.7 | .395 | 2.76 | .86 | 3.29 | 7.72 | 14.20 | 3.39 |
| 7 | 1.10 | Cottonseed cake | 54.1 | .371 | 2.96 | 1.05 | 3.21 | 8.15 | 14.20 | 3.11 |

The following prices were charged: Corn 84 cts. a bushel, and alfalfa $10, linseed meal $45, cottonseed meal $45, and cold-pressed cottonseed cake $40 a ton.

The amounts of alfalfa hay consumed were about equal in lots 1, 2, and 3, and it is pointed out that the gains were in proportion to the quantity of corn eaten.

Lot 4, which received silage in addition to corn and alfalfa, gained at the rate of 0.377 lb. per head per day and consumed 3.08 lbs. of silage per pound of gain. This quantity of silage effected a reduction of 0.7 lb. in the corn and 0.36 lb. in the alfalfa required for a pound of gain if lot 1 is taken as the check. With silage charged at $5 a ton, the cost of a pound of gain was 6.18 cts. This lot sold for 14.1 cts. a pound and yielded a profit of $3.70 a head.

Two lots were given linseed meal and shelled corn in self feeders, one (lot 8) having access to prairie hay and the other (lot 9) to alfalfa hay. Both lots were marketed in 64 days. Lot 8 gained at the daily rate of 0.422 lb. per head and consumed 2.42 lbs. corn, 2.84 lbs. linseed meal, and 1.42 lbs. of hay per pound of gain. The corresponding consumption by lot 9 was 2.07, 2.42, and 1.76 lbs., respectively. The average daily gain in lot 9 was 0.459 lb. In spite of the fact that prairie hay was charged at $1 less per ton than alfalfa, the cost of a pound of gain in lot 8 was 10.7 cts. and in lot 9, 9.4 cts. Both lots sold for the same price but the alfalfa feeding resulted in over twice the profit ($2.45 as compared with $1.04).

**Sheep and wool in South Africa and their relation to industrial development.** C. MALLINSON (*So. African Jour. Indus., 1 (1918), No. 12, pp. 1105–1112*).—Notes on the extent and nature of the sheep industry in the Cape Province, Orange Free State, the Transvaal, and Natal are presented, as well as statistics on the export of wool, mohair, sheepskins, and goatskins from the South African Union from 1909 to 1917.

**Our National herds of buffalo,** T. S. PALMER (*Ann. Rpt. Amer. Bison Soc., 10 (1915–16), pp. 40–62, figs. 2*).—Information is provided concerning the origin and increase of the various herds of American bison located in National parks and game preserves.

**The efficiency of pigs,** R. C. ASHBY (*Swine World, 8 (1919), No. 2, p. 15*).—The feeding and growth records of 63 pigs, each kept in a separate pen at the Minnesota Experiment Station, are briefly summarized with respect to individual variation in the economy of gain. Different groups of from 5 to 16 animals were fed in the course of 3 years, some on pasture and some in dry lot, but the individuals of any one group were all furnished the same choice of feeds. Fuller reports of some of the groups have been noted (E. S. R., 40, pp. 770, 771). The feet consumption per unit gain of 22 animals deviated, it is stated, more than 10 per cent from the average of their respective groups and that of 19 deviated between 5 and 10 per cent.

"The next step is to select many individuals and through breeding experiments determine whether it is possible to develop strains of hogs that are unusually efficient producers."

**Measuring a hog's efficiency,** R. C. ASHBY (*Breeder's Gaz., 76 (1919), No. 11, p. 462*).—This paper is the same as the one noted above.

**The behavior of chickens restricted to the wheat or maize kernel, II,** E. B. HART, J. G. HALPIN, and H. STEENBOCK (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 415–420, pl. 1*).—This paper, from the Wisconsin Experiment Station, reports what is essentially a repetition of the earlier work of Hart, Halpin, and McCollum (E. R. S., 36, p. 668) with somewhat younger (or at least lighter weight) birds. Nine cages (lots) of Rhode Island Red pullets were used, 3 to a cage, and the experiment continued for 8 months during the winter and spring of 1916–17.

The lots fed corn meal and corn gluten feed, with or without complex salt mixtures, and the lot fed corn meal and casein continued to thrive and made slow gains. In contrast to the previous results with more mature birds, all but one of the 12 chickens whose grain feed was from the wheat plant exclusively died within 3 months. "The birds that died became greatly emaciated, but no other symptoms of striking character developed. However, when excited, they would often be seized with serious spasms, provoking extraordinary flapping of the wings, followed by exhaustion and collapse." The one that survived belonged to a lot receiving casein and butterfat in addition to wheat meal.

**Blood fat in domestic fowls in relation to egg production**, D. E. Warner and H. D. Edmond (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 281–294*).—The percentages of fat (total ether extract) in samples of blood collected at the end of October from 94 White Leghorn fowls at the Connecticut Storrs Experiment Station are reported.

The mean for 16 hens that had about completed their pullet year but which were still actively laying is given as 1.109 per cent. The mean for 54 similar yearlings that had stopped laying some time before (51.7 days on an average) was 0.199. The mean for 12 hens at the end of their third year and not actively laying was 0.171, and that for 12 cockereds was 0.176. The blood samples of the males seemed to be much less variable in fat content than those of the females.

The pullet year egg record of each of the 70 yearlings is also recorded. The average of the laying birds is given as 162.8, that of the others as 139.1. Twelve of the former and 6 of the latter were classified as having pale beaks, legs, and vents. The average egg production of the 18 individuals was 168.2 and the average blood fat content 0.816 per cent. Nine of the mature hens and 23 of the inactive yearlings were classified as having yellow beaks, legs, and vents. The average egg production of this group of 32 was 117.9 and the average blood fat content 0.196 per cent.

The following are some of the conclusions drawn from these facts: "There is little or no correlation between the amount of fat in the hen's blood and her yearly egg yield. On the other hand the blood of a hen laying at the time the sample is taken is much richer in fat than that of a hen that is not laying. . . . There exists a close [negative] correlation between the color of the beak, legs, and vent and the percentage of fat found in the blood. . . . This would show that birds that were not laying were storing fat in the body cells, and consequently their legs, beaks, and ani would become yellow, the natural color for all American breeds and the Leghorns."

The blood samples of 12 hens were known to have been taken after a 16-hour fast. The average fat percentage was 0.009 higher than that of another group of 12 which had not fasted. The difference is considered trifling.

The cholesterol in the blood samples of a few of the birds was determined by the colorimetric method described by Bloor (E. S. R., 35, p. 13). The average of 11 active layers was 0.114 per cent, of 7 inactive yearings 0.086 per cent, and of 4 males 0.086 per cent.

**Note on the relation of blood fat to sex, and on the correlation between blood fat and egg production in the domestic fowl**, O. Riddle and J. A. Harris (*Jour. Biol. Chem., 34 (1918), No. 1, pp. 161–170*).—Correlation coefficients between percentage of fat in the blood and the annual egg production are computed from the data concerning yearling hens furnished by Warner and Edmond in the paper noted above. For the 16 actively laying birds this correlation was found to be $+0.351 \pm 0.147$ and for the 54 inactive birds $-0.296 \pm 0.084$. "Now, while the probable errors of these correlations are large, because of the relatively few determinations, the correlations suggest at once that while the birds are laying those which have the highest percentages of blood fat are those which make the highest egg records, but that after the bird has ceased laying in the autumn those which have laid the greatest number of eggs during the year have the blood most depleted of fat; or, at any rate, have blood with least fat."

The inactive birds were further subdivided according to the time elapsed since laying ceased. For the 16 which had laid within 24 days the correlation was $+0.054 \pm 0.168$. For the 22 whose inactive period varied from 25 to 29 days the correlation was $-0.132 \pm 0.141$, and for the 16 which had not laid for 60 or more days it was $-0.620 \pm 0.103$. Attention is called to the progressive change in

correlation. The correlation was $-0.411 \pm 0.117$ in the case of the 23 birds with beak, legs, and vent colored yellow, and $+0.532 \pm 0.114$ in the case of the 18 in which these organs were pale.

Mainly on the basis of these determinations some of the conclusions of Warner and Edmond are criticized, and these authors are also charged with ignoring prior work of Lawrence and Riddle (E. S. R., 37, p. 773).

**Blood fat in fowls**, D. E. Warner and H. D. Edmond (*Jour. Biol. Chem., 34 (1918), No. 1, pp. 171–174*).—This is a reply to criticisms of Riddle and Harris (noted above).

The authors state that they do not consider a correlation to be marked unless the absolute value of the coefficient is 0.3 or more and is at least 6 times the size of the probable error. They also hold that the work of Lawrence and Riddle "does not fulfil the requirements for carefully controlled experimental study" inasmuch as (1) only 3 males, 3 nonlaying females, and 5 laying females were used, (2) four different breeds were represented and several of the birds were mongrels, (3) the ages varied from 11 months to 4 years and are vaguely designated, and (4) the blood samples were not all collected at the same season of the year.

**Fertilization of hens' eggs**, D. F. Laurie (*Jour. Dept. Agr. So. Aust., 22 (1919), No. 6, pp. 459–464*).—In November, 1918, 6 hens that had been isolated from male birds for several months were each allowed to mate once. Two laid fertile eggs up to the fifteenth day afterwards, 2 until the fourteenth day, and 2 laid only infertile eggs. A previously published table (E. S. R., 29, p. 574), showing the continued production of fertile eggs by flocks of hens up to the seventeenth day after the removal of the cock, is reprinted, but with the date of observation changed from the summer (December, 1911, and January, 1912) to the spring (October and November, 1911).

**Experiments in caponizing fowls**, D. F. Laurie (*Jour. Dept. Agr. South Aust., 22 (1918), No. 1, pp. 40–43*).—The post mortem examination is reported of several cocks which had been incompletely castrated as cockerels, and which had subsequently developed the secondary sexual characters and behavior of typical males. In the cases where both testes had been operated on, it was found that a mutilated piece had continued to function and often had grown into a more or less normal testis.

## DAIRY FARMING—DAIRYING.

**The consumption of milk in the United States**, L. B. Cook (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 5 (1916), pp. 281–283*).—Replies to a questionnaire regarding milk consumption and milk prices sent out by the Dairy Division of the U. S. Department of Agriculture to cities in the United States are summarized by geographical (census) divisions. In general, regions where the price was high reported a low per capita consumption.

**Ice cream, a factor in dairying**, R. M. Washburn (*Milk Mag., 7 (1919), No. 4, pp. 16, 52*).—The author estimates that the amount of butterfat consumed annually in the United States as ice cream is five times as large as the amount of butterfat exported as butter, and holds, therefore, that the summer ice cream trade helps to maintain the price of butterfat during the period of excess milk production. Ice cream is also considered a profitable outlet for the solids-not-fat of milk.

**The importance of clean utensils in clean milk production**, G. B. Taylor (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 6 (1917), pp. 164–172*).—Physical and bacteriological examinations of a number of 10-gal. shipping cans

washed in a commercial milk plant are reported. The material for plating was secured by pouring 400 cc. of distilled water into the can.

In a limited number of cases satisfactory conditions were found when the cans had been inverted over a steam jet for from 30 to 60 seconds. Cans held for 6 minutes in a washing machine, where they were scrubbed, steamed, and then dried in a current of warm air, were in general without musty odor and yielded relatively few bacteria, except when the cans were very rusty or the rinse water was turbid.

Two simple and inexpensively operated devices for heating water on dairy farms are also described.

**Observations on the pasteurization and subsequent handling of milk in city milk plants**, R. S. Smith (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 7 (1918), pp. 96–114; abridged in Creamery and Milk Plant Mo., 8 (1919), No. 5, pp. 33–35*).—Several specific instances are reported of faulty practices in city milk plants whereby pasteurized or supposedly pasteurized milk contained unduly large numbers of bacteria at the time of marketing. The practices include (1) "pasteurization" at unintentionally low temperature, (2) allowing a rise in temperature after cooling, and (3) use of unsterile coolers, botttling machines, milk bottles, and bottle caps. The number of bacteria introduced by the various pieces of apparatus were estimated by washing them in measured amounts of water and plating the wash water. In continuation of the work of Webster (E. S. R., 41, p. 373), with which the author was connected, results of the bacteriological examination of 236 freshly washed milk cans intended for pasteurized milk are also summarized to show that these likewise are a fruitful source of bacteria.

Health officials are cautioned not to assume that the mere passage through a pasteurizer of all the milk sold in a city necessarily insures a sanitary supply.

**The sediment test as applied to dairy inspection**, W. E. Ward (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 7 (1918), pp. 54–60*).—The author cites illustrative data to show a close correlation between an inspector's reports of conditions on a series of dairy farms, and the color of the cotton disks used in sediment tests of milk from these farms made independently at receiving stations and railroad platforms. It is held that systematic sediment tests and temperature determinations of milk at delivery points would enable inspectors to determine what farms need most attention or require reinspection.

The author also claims that by examining the material collected on the disk with a lens he can judge quite accurately what faulty conditions occur on the farm furnishing the milk.

**Simplified city milk inspection**, H. A. Harding (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 7 (1918), pp. 201–211*).—The author would (1) reduce or perhaps abolish farm inspection, (2) require all milk sold to be pasteurized, (3) establish rigorous inspection of pasteurizing plants, and (4) require the market grade and fat percentage to be marked in the bottle cap. Only three market grades are considered necessary, viz, special, table, and cooking milk, the classification (with pasteurization assumed) being based on cleanliness and keeping qualities. Samples collected from the distributors' wagons would be subjected to the Babcock and sediment tests and some simple test of keeping quality, such as the acidity and flavors developed after holding for 24 hours at 60 or 65° F. More complicated tests, including bacterial counts, are omitted so that the dealer himself can readily determine what grade of milk he is selling. A dealer caught misbranding his milk would lose his license.

Any proposed additions to these requirements "should be carefully scanned both as to their soundness and as to their results. The price of milk is already

high. Every additional requirement either raises the price of milk or decreases the supply, and neither of these results will be taken kindly by the consuming public."

**Modern developments in dairy inspection**, E. KELLY (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 7 (1918), pp. 37–41*).—The author claims that dairy inspection properly includes attention to general cleanliness about the premises, partly to increase the morale of milk handlers and insure their vigilance in more essential matters, and partly to advertise milk as an inviting article of food.

**Report on questionnaire to health officers concerning control of the milk supply**, G. B. TAYLOR (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 7 (1918), pp. 118–200*).—In order to obtain information regarding laboratory control of the milk supply and the extent of dairy inspection in the United States, a questionnaire was sent by the Dairy Division of the U. S. Department of Agriculture in April, 1918, to the health officers of all cities of over 5,000 population and to State and Territorial boards of health. Replies were received from 481 cities in 40 States and Hawaii, and from 24 State laboratories or similar agencies. Each reply is summarized in the appendix to the author's paper. There are also a list of health departments having no laboratories for the examination of milk, and a tabultion by cities of opinions concerning inspection and bacterial counts. The replies cover chemical and bacteriological methods in use and the manner of collecting the samples.

The author provides a general summary and discussion, and deplores the lack of uniformity in methods and the poor control over milk supplies generally exercised by the smaller cities.

**Milk inspection from the point of view of the Bureau of Chemistry of the U. S. Department of Agriculture**, C. L. ALSBERG (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp., 5 (1916), pp. 296–306*).—This is an informal account of the effort of the Bureau of Chemistry, working in collaboration with the Dairy Division, to improve the efficiency of milk inspection. The author suggests regional clearing houses for inspection reports so that one dairy farm will not be inspected by several different agencies.

**Cooperation and the organization of the dairy industry** (*Jour. Bd. Agr. [London], 25 (1918), No. 9, pp. 1081–1090*).—This is an account of the development of cooperative cheese factories and milk depots in England, particularly since the establishment of the dairy branch of the Agricultural Organization Society in 1912. The activities of the cooperative cheese schools in operation during 1917 and 1918 are also explained. Part of the business of these schools is to train cheese makers, but their main function, apparently, is to demonstrate to the farmer the advantages of the cooperative factory system, and to urge on financial grounds the desirability of more cheese making and less butter making in country districts.

**Report on the working of a cooperative cheese school** (*Jour. Bd. Agr. [London], 25 (1918), No. 9, pp. 1091–1093*).—This is a report of a cheese school held near Newbury, in Berkshire, from May to September, 1918.

**The cooperative dairy at Telinkheri in its relation to dairying in the Central Provinces**, D. CLOUSTON (*Agr. Jour. India, 13 (1918), No. 1, pp. 54–64, pls. 3*).—An account is given of the operation under governmental auspices in the Central Provinces of India of a privately owned plant for the distribution of milk and the manufacture of butter and ghee. The milk is furnished by a number of buffaloes and a few cows housed on a government dairy farm, most of the stock being the property of the native professional milkmen (gowlies), who by tactful management have been persuaded to form cooperative societies under the supervision of the farm overseer.

The plans are also outlines for improving the three local breeds of buffaloes by the use of Delhi sires brought in by the government. The cost of raising young buffalo stock is also estimated. The expenses per head, except where grazing is cheap, were found to exceed the value of an adult of the native breeds.

Buffaloes' milk collected at the dairy for analysis in 1917 (146 samples) averaged 7.1 per cent of butter fat, while the cows' milk (37 samples) averaged 4.2 per cent. To produce a pound of butter required 11 lbs. of buffaloes' milk or 19.5 lbs. of cows' milk.

**Fifth annual report of the creamery license division for the year ending March 31, 1919,** O. E. Reed and T. H. Broughton (*Indiana Sta. Circ. 93 (1919), pp. 3–56, figs. 4*).—This report contains the names of licensed testers in Indiana, a list classified by counties of the licensed creameries, cream stations, milk stations, condenseries, etc., in the State, and miscellaneous matter similar to that in preceding reports (E. S. R., 39, p. 884).

## VETERINARY MEDICINE.

**Report of the twenty-second annual meeting of the United States Live Stock Sanitary Association** (*Rpt. U. S. Live Stock Sanit. Assoc., 22 (1918), pp. VIII+213, figs. 14*).—This report of the proceedings of the annual meeting held at Chicago, December 2 to 4, 1918, includes the following papers: Tuberculosis Eradication, by J. A. Kiernan (pp. 29–52) (E. S. R.,40, p. 681); The Retest of Reacting Cattle, by J. G. Wills (pp. 53–84); Efficiency Principles Applied to the Animal Tuberculosis Problem, by B. R. Rogers (pp. 84–95); Blackleg Immunization, by A. Eichhorn (pp. 102–112); Hemorrhagic Septicemia, by R. Graham and E. Records (pp. 113–124); Some Phases of Parasitism, by A. T. Kinsley (pp. 125–134); Necrobacillosis, by C. P. Fitch (pp. 135–147) (E. S. R., 41, p. 87); Relation of the Sanitarian to the Stock Breeder, by D. A. Wallace (pp. 161–163); Observations Concerning the Dissemination of Hog Cholera by Insects, by M. Dorset, E. N. McBryde, W. B. Niles, and J. H. Rietz (pp. 163–174) (E. S. R., 41, p. 578). Reports of committees relating to hog cholrea control, tick eradication, accredited herds, tuberculosis eradication, infectious abortion, etc., are included.

**Report on operations of the veterinary sanitary service of Paris and the Department of the Seine during the year 1917,** H. Martel (*Rap. Opér. Serv. Vét. Sanit. Paris et Dépt. Seine, 1917, pp. 150, figs. 6*).—This is the usual annual report (E. S. R., 39, p. 679), with the usual tabular data.

**Annual administration report of the civil veterinary department in Baluchistan for the official year, 1918–19,** J. G. Cattell (*Ann. Admin. Rpt. Civ. Vet. Dept. Baluchistan, 1918–19, pp. 14*).—This report includes tabular data which show the number of deaths from contagious diseases among animals during the year under report.

**Annual administration report of the Bombay Veterinary College and civil veterinary department in the Bombay Presidency (including Sind)** (*Ann. Admin. Rpt. Bombay Vet. Col. and Civ. Vet. Dept. Bombay, 1916–17, pp. 58; 1917–18, pp. 52*).—These reports include data on the number of deaths from contagious diseases among animals.

**Theory of invasion by infective agents,** A. G. McKendrick (*Indian Jour. Med. Research, 6 (1919), No. 4, pp. 614–632, figs. 6*).—Certain considerations regarding the formation of antibodies in response to the invasion of the body by infective agents are discussed and summarized as follows:

"The introduction of organisms (or their products) into the body system causes an acceleration in the rate of production of antibodies. It is reasonable

to assume that the degree of response is proportional to the logarithm of the stimulus, and to the tissue reactivity. The stimulating power of an organism (or its products) probably depends upon its degree of saturation (sensitization)."

On the basis of this theory a system of classification of diseases due to organismal invasion on the one hand and influences acting in a contrary manner on the other is outlined, in which the main clinical types of diseases fall into a broken series. At the two extremes of this series stand diseases like pneumonia, in which protective efforts are in excess, and chronic infection in which protective efforts are continually overbalanced. Malta fever, representing a type of relapsing disease, lies near the neutral point in this scheme, where the balance between protective efforts and opposing influences is exact.

**The effect of feeding yeast on antibody productions.** E. P. WOLF and J. H. LEWIS (*Jour. Infect. Diseases, 25 (1919), No. 4, pp. 311–314*).—With a view to a possible explanation of the therapeutic value claimed for yeast in infectious diseases, the effect of the feeding of yeast on the production of antibodies to sheep blood cells in rabbits was studied.

From the results obtained, the authors conclude that yeast does not act by increasing antibody formation in the rabbit. On the contrary, it may even cause a reduction in the amount of antibodies formed as compared with those of the control animals. Yeast was also found to be lacking in the laxative value.

**Hydrogen-ion concentration of cultures of pneumococci of the different types in carbohydrate media.** O. T. AVERY and G. E. CULLEN (*Jour. Expt. Med., 30 (1919), No. 4, pp. 359–378, figs. 2*).—This paper reports a study of the H-ion concentration of cultures of pneumococcus in carbohydrate media under different conditions, the results of which may be summarized as follows:

The optimum H-ion concentration for the growth of pneumococcus is pH 7.8. If sufficient fermentable carbohydrate (above 0.4 per cent) is present in broth cultures of pneumococcus, growth continues until a final H-ion concentration of about pH 5 is reached, but if less carbohydrate is present growth ceases at a lower H-ion concentration. If no carbohydrate is present except that extracted from the meat of which the broth is made, growth initiated at pH 7.8 ceases at about pH 7.

If bacteria-free filtrates of plain broth cultures in which growth has ceased are readjusted to pH 7.8 and reinoculated with pneumococcus, no growth occurs unless carbohydrate is added, but a similar readjustment of bacteria-free filtrates of dextrose broth cultures causes growth.

All of the carbohydrates which were fermentable under the conditions used gave the same results in the rate of reaction change and final H-ion concentration attained, and the different immunological types of pneumococcus behaved alike in fermenting these carbohydrates.

**The pathogenicity of Bacterium melitensis for guinea pigs.** K. F. MEYER, E. C. FLEISCHNER, and E. B. SHAW (*Proc. Soc. Expt. Biol. and Med., 16 (1919), No. 8, pp. 152–156*).—The authors confirm the relationship of *Bacillus abortus* to *B. melitensis* previously demonstrated by Evans (E. S. R., 39, p. 289), and announce two additional characteristics of similarity as follows:

(1) Guinea pigs infected with *B. abortus* developed striking reactions of cutaneous hypersensitiveness with melitensis protein, and in animals successfully infected with *B. melitensis* skin reactions were obtained with abortoprotein. (2) By intratesticular injection in guinea pigs of a one-tenth agar slant of strains of *B. melitensis*, a disease was produced with pathological changes which could not be distinguished from those seen in guinea pigs suffering from abortion disease. The lesions of two guinea pigs were diagnosed definitely to be the result of a *B. melitensis* infection only by cross agglutination and absorption with the recovered bacteria.

**Some morphological and biological characters of the spirilla (Vibrio fetus n. sp.) associated with disease of the fetal membranes in cattle**, T. SMITH and M. S. TAYLOR (*Jour. Expt. Med., 30 (1919), No. 4, pp. 299–311, pl. 1*).—In this paper are reported further observations on the morphological and cultural characteristics of the spirilla previously found to be associated with certain cases of infectious abortion in cattle (E. S. R., 40, p. 383), together with studies of the agglutinative affinities of the various strains.

Twenty-two fetal and two calf strains of spirilla, obtained from one large herd into which cattle from outside were introduced at irregular intervals, were studied. Of the fetal strains, all but one agreed closely in morphological and biological characteristics, and all belonged to the same group with respect to agglutination affinities. Of the two calf strains, one had definite agglutination reactions with the fetal strains and the other none. Both resembled the fetal strains morphologically and culturally.

Since the organism appears in both long spiral and short comma forms in fetal fluids, but tends to assume the comma form in its early most active stage of multiplication in cultures and has single polar flagella, it has been designated *V. fetus* n. sp., although the term spirillum is still used as a general expression.

Attention is called to the fact that there is a decided difference between the cultural characteristics of early and late cultures, the organisms gradually becoming saprophytized.

**The etiological relation of spirilla (Vibrio fetus) to bovine abortion**, T. SMITH (*Jour. Expt. Med., 30 (1919), No. 4, pp. 313–323*).—To determine whether *V. fetus*, noted above, is a true agent causing disease of the fetal membranes or simply an invader from the more external tract, or from the blood after the fetus has been injured or killed by other nonbacterial agencies, four pregnant cows were inoculated intravenously with agar cultures of *V. fetus* obtained from aborted fetuses. After the birth of the calf the placentas and postpartum discharges were examined for evidences of *V. fetus* and of *Bacillus abortus*.

In two of the cases disease of the fetal membranes resulted, corresponding with the lesions found in earlier cases associated with spirilla. Spirilla were found in the early postpartum discharges of one of these animals. No evidence of *B. abortus* was obtained. Although the other two cases were entirely negative, it is felt that strong evidence has been given in this study that *V. fetus* is an etiological factor in bovine abortion.

**The bacteriology of bovine abortion, with special reference to acquired immunity**, T. SMITH (*Jour. Expt. Med., 30 (1919), No. 4, pp. 325–339*).—In this paper the author has tabulated and discussed the bacteriological data obtained in the study of cases of abortion in the herd mentioned in the above paper and earlier contributions, with a view to determining the bearing of the bacteriological results upon the nature of the infectious process leading to the death and expulsion of the fetus and upon the acquisition of immunity by the cow against later infection. The bacteriological examination included a relatively thorough study of the fetus and of the membranes or swabs from the uterus.

Of the 109 cases of abortion studied 62 were associated with *Bacillus abortus*, 26 with spirilla, 2 with *B. pyogenes*, and 19 were either sterile or else the digestive and respiratory tracts had been invaded during or after birth with miscellaneous bacteria. On the assumption that purchased cows coming from small herds were free from any immunity and that their first pregnancy in the new herd was equivalent to that of a native heifer and may be counted as first, the distribution of *B. abortus* and *V. fetus* in succeeding pregnancies was as follows:

*B. abortus* was associated with the first pregnancy in 42 cases, with the second in 14, with the third in 5, and with the fourth in one case. In pur-

chased cows, spirilla were associated with the first pregnancy in 6, with the second in 9, with the third in 5, and with the fourth in 3 cases. In native cows there were no spirilla associated with the first pregnancy, 1 with the third, 1 with the sixth, and 1 with the eighth.

A tentative explanation of the fact that thus far spirilla have not been encountered in native heifers of the herd giving birth the first time is that "the young stock is kept segregated from the older and purchased cows until shortly before calving. The occasional discharge of a fetus among the young stock in pasture tends to keep up the disease due to *B. abortus*. Later on, association with older cows brings about infection with spirilla (*V. fetus*) and more rarely with other possible agencies of fetal disease. On the other hand, abortions may occur among the pastured stock from time to time and remain unrecognized. Not until both groups of animals are subjected to the same daily scrutiny will it be possible to affirm that abortion associated with spirilla does or does not occur among young stock."

**An interpretation of the agglutination reaction to Bacillus abortus in 75 cases of bovine abortion bacteriologically controlled**, E. W. Smillie, R. B. Little, and L. Florence (*Jour. Expt. Med., 30 (1919), No. 4, pp. 341–357*).—This paper gives the results of a study of the agglutination test for *B. abortus* in 75 of the cases noted in the above article, together with tests for *B. abortus* in the milk in certain cases.

Of 19 cases in which spirilla were found, 11 gave negative results in the agglutination test for *B. abortus* (considering an agglutination titer up to and including 1:40 as negative). In 2 cases a maximum titer of 1:1280 for *B. abortus* was associated with the presence of this bacillus in the milk. In 4 cases the titer indicated an earlier infection with *B. abortus*, the milk tests of 3 of these cases being negative. One case showed a remarkable rise in agglutination titer following the discharge of a fetus containing spirilla, but not *B. abortus*. One case gave a titer of 1:640 after an abortion associated with positive spirilla cultures and negative tests in the milk.

Of 11 cases of abortion characterized by sterile fetuses or by miscellaneous infection of the digestive and respiratory tracts, 8 showed a titer of 1:20 or lower. The higher titers in the other cases could be explained by earlier *B. abortus* infection. Of 44 cases of abortion associated with *B. abortus* in the fetus, the membranes, or the udder, agglutination titers of less than 1:80 were obtained in 8 cases, of 1:80 in 2, of 1:160 in 3, of 1:320 in 6, of 1:640 in 16, and 1:1280 in 9 cases.

The authors conclude as a result of these observations that, although no definite rules can be formulated for the interpretation of the agglutination reaction quantitatively, it is, when so carried out as to give the entire range of serum dilutions to the limits of clumping, a delicate test which reflects a variety of conditions involved in infection with *B. abortus*, such as its time relation to the act of abortion and the length of time the abortion bacilli live and multiply in the pregnant uterus. In the individual cow, in general, a titer of 1:40 or less is thought to indicate that the cow is not infected with *B. abortus* at the time of blood examination. It does not, however, exclude former infections in the case of older cows, nor exclude absolutely very recent infection. The highest titers, 1:640 and above, are considered to indicate recent infection and, in the absence of recent premature births, infection of the udder. Intermediate titers may indicate a gradual rise or decline of agglutinins preceding or following abortion without infection of the udder, or a relatively high resistance or partial immunity in the cow.

"In any herd a uniformly low titer (1:40 or less) in all animals may be regarded as indicating the entire absence of *B. abortus*. A high titer in any

one cow serves to indicate quite definitely the presence of infection in the herd. To determine more accurately the character of the infection in any individual cow there is needed, in addition to the quantitative agglutination test, a bacteriological study of the milk and of any prematurely discharged calf or fetus."

A comparative study of Leishmania infantum of infantile kala azar and Leptomonas (Herpetomonas) ctenocephali parasitic in the gut of the dog flea, E. E. Tyzzer and E. L. Walker (*Jour. Med. Research, 40 (1919), No. 2, pp. 129–176, pls. 3, figs. 3*).—This is a report of an investigation which was limited to the study of the flagellate of the dog flea (*Ctenocephalus canis*) of the United States and the parasite of human kala azar of the Mediterranean region (*L. infantum*). The authors prefer to consider the leptomonads as constituting one or more genera comprised of many distinct species rather than collectively as races or varieties of a single species.

A list of 49 references to the literature is included.

Necrobacillosis, G. B. Morse (*Amer. Jour. Vet. Med., 14 (1919), No. 9, pp. 457–460*).—An address delivered at Omaha in July, 1919.

The effect of potassium iodid on experimental sporotrichosis, D. J. Davis (*Jour. Infect. Diseases, 25 (1919), No. 2, pp. 124–131*).—"Experimental sporotrichosis in rats responds promptly to potassium iodid. The lesions in the peritoneal cavity become firm, hard, and small, and are surrounded by a dense fibrous capsule; within the nodules living sporotricha are found for a long time (at least four months). Potassium iodid will not prevent experimental sporotrichosis, but will cure it.

"It is suggested that sporotrichosis, so readily produced experimentally, furnishes a good opportunity for the study of the behavior and reactions of iodin and iodids in chronic infections."

A comparison of the life cycle of Crithidia with that of Trypanosoma in the invertebrate host, I. McCulloch (*Univ. Cal. Pubs. Zool., 19 (1919), No. 4, pp. 135–190, pls. 5, figs. 3*).—This report of investigations conducted includes a bibliography of 26 titles.

Tuberculin tests, C. C. Walker (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 1, pp. 5–14*).—The author discusses the value of the subcutaneous, intradermal, and ophthalmic tuberculin tests in tuberculosis eradication work, with illustrations from actual practice in 11 herds in Montana. In some of these herds the intradermal test proved more efficient than the subcutaneous, and in others the value of the two tests appeared to be about equal. The ophthalmic test is considered valuable in checking the findings of the other two tests.

New and nonofficial remedies, 1919 (*Chicago: Amer. Med. Assoc., 1919, pp. 388+XXIX*).—The 1919 edition of this book contains certain revisions and additions to the 1918 edition previously noted (E. S. R., 40, p. 284), while other articles, a list of which is given in the preface, have been omitted. "Attention is called to the revision of the article on digestive ferments; to the description of chlorinated eucalyptol; to the replacement of the monograph for neutral solution of chlorinated soda by one for surgical solution of chlorinated soda; to the discussion of sulphoichthyolate preparations; to the revision of the general and the special discussions of serums and vaccines; and to the article on silver preparations."

Note on the Hygienic Laboratory method of standardizing disinfectants (*Pub. Health Rpts. [U. S.], 34 (1919), No. 42, pp. 2297, 2298*).—A modification of the Hygienic Laboratory method of preparing beef extract medium for use in the standardization of disinfectants is described as follows:

A 500-gm. portion of finely chopped round steak is placed in 1,000 cc. of tap water and allowed to stand in a cool place for 24 hours, and is then strained

through cheesecloth by means of a tincture press until 1,000 cc. of filtrate is obtained. This is heated in streaming steam for 1 hour, filtered through paper, and the volume made up to 1,000 cc. and titrated. The reaction is corrected to approximately neutral with N sodium hydroxid, after which 1 per cent of peptone and 0.5 per cent of sodium chlorid are added and the liquid is heated in streaming steam for 30 minutes. The final reaction is corrected to pH 7.6. The medium is filtered through paper into test tubes, 10 cc. per tube, and sterilized in steam for one and one-half hours, or in an autoclave for 15 minutes at 15 lbs. pressure.

**Studies on anthelmintics, III–IV**, M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 6, pp. 652–659; 56 (1919), No. 1, pp. 59–70*).—Experiments in continuation of those previously noted (E. S. R., p. 480) indicate that chloroform is safe, and is more effective against hookworms in single dose than any other anthelmintic.

In experiments with combinations of oil of chenopodium and chloroform, "the best results in the removal of hookworms by a single-dose treatment . . . were obtained by the use of oil of chenopodium in a dose approximating 0.1 mil per kilogram, as near as the dose can be approximated in 5 and 10 minim soft, or soluble elastic, capsules, followed immediately by 30 mils of castor oil containing chloroform at the rate of 0.2 mil per kilogram or with this amount of chloroform given in hard gelatin capsules. . . . This same treatment was 97 per cent effective against ascarids in tests on 15 dogs, of which 9 had ascarids. The treatment was comparatively ineffective against whipworms, which require repeated treatments, not single treatments. The treatment was also ineffective against tapeworms, but neither of these drugs is dependable against tapeworms."

**Further report on lymphangitis in cattle caused by acid-alcohol-fast organism**, J. TRAUM (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 6, pp. 639–652, figs. 5*).—This is a further report of studies of the affection previously noted (E. S. R., 36, p. 82).

The investigations show the disease to resemble tuberculosis in the character of the lesions and by the presence of acid-fast organisms in the lesions. "It further resembles tuberculosis by the fact that a large percentage of cases under discussion give positive reactions to the intradermal tuberculin test; a number of such reactors have been autopsied . . . and in none of the cases did we find tuberculosis; in fact, in some of the reactors tuberculosis could be definitely eliminated.

"That it is not tuberculosis is satisfactorily demonstrated by the failure to produce a single case of tuberculosis in the large number of guinea pigs inoculated with materials from the above-described and other cases. The organism isolated from lesions and described here as the probable causative agent resembles tubercle bacilli to some extent, differing, however, sufficiently in the character and speed of growth and microscopic appearance of smears from the cultures to easily differentiate it from tubercle bacilli."

**Iris poisoning of calves**, E. A. BRUCE (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 1, pp. 72–74*).—The author records the death of several calves from 3 to 6 months of age from having fed on the leaves of a blue-flowering bulbous variety of iris grown under cultivation at Abbottsford, B. C.

**Don't feed foxtail hay to lambing ewes**, C. E. FLEMING and N. F. PETERSON (*Nevada Sta. Bul. 97 (1919), pp. 18, figs. 13*).—This is a report of studies made of the injurious effects of feeding ewes during the lambing season on hay containing quantities of squirrel tail grass (*Hordeum jubatum*), also known as tickle or foxtail grass and wild barley, a recent account of which grass by Pammel in Iowa has been noted (E. S. R., 39, p. 842.)

Due to awns or beards on this grass it is one of the worst pests occurring in Nevada, not only because it is directly or indirectly responsible for loss of condition and death of sheep but also because of the pain and suffering produced when fed in hay. This grass is now widely and abundantly distributed in Nevada and across North America. In many places it is becoming a serious menace on land which is used for the production of hay. It is dangerous as soon as it heads, which at Reno is about June 1, and when dried and fed in considerable quantities it becomes obnoxious and destructive.

"The number of seeds in a head varies from 30 to 60, with an average of approximately 40 seeds to the head. A plant 4 inches across the crown will produce about 50 heads to the plant with a total of approximately 2,000 seeds or 14,000 awns per plant."

Being a perennial it is difficult to control. A practical means of preventing losses from it on haylands is to graze with sheep early in the spring when the grass is high enough to be tempting and palatable. In this way the vitality of the squirrel tail grass is reduced and the other grasses are given an even chance to grow.

The injury when fed to live stock is caused by infestation of the delicate tissues in the region of the eye, the membranes of the mouth, the sides of the jaw, or the wool of the head, neck, and back. As soon as the awns become lodged, they begin to work into the flesh, causing injuries which affect the condition of the animal and frequently lead to very serious consequences or death.

"In the examination of heads of sheep the following types of injury were observed: (1) Some awns found in the ears, where they caused abscesses, due to mechanical injury and subsequent infection by bacteria; or (2) in the mucous membranes of the upper and lower eyelids, causing inflammation with a discharge of a yellowish-white opaque creamy pus. (3) They were commonly found between the eyeball and the tissues of the orbit, causing semi or total blindness. (4) Many awns had penetrated the skin of the head between the nose and the forehead or on the cheek and around the eye, causing the wool and hair to slough off with the formation of pustules, or small abscesses. (5) They had become imbedded in the lips, causing redness and swelling, with a formation of small pimple-like elevations filled with pus. (6) Awns were common on all surfaces of the tongue; and (7) in the openings of the gland secreting into the mouth. (8) Others had penetrated into the nasal passages, causing extreme irritation. (9) In nearly all heads examined, masses of awns were imbedded in the gums beside the molars of both upper and lower jaws. (10) They had worked in around the incisors and caused them to loosen in their sockets and fall out. The gums had shrunken away from the teeth and in many cases there was ulceration and decay. In other instances they were imbedded in the palate. (11) Many were found in the soft tissues under the tongue."

Brief accounts are given of the findings in examinations made of 21 heads selected at random, March 14, 1919, from a pile of over 300 carcasses of range ewes that had been feeding on hay containing a high percentage of squirrel tail grass. Yearling lambs and aged ewes were found to suffer the most, and Merino and Rambouillet sheep to be injured more than the more open-wooled and smooth-bodied breeds.

**Bacillus necrophorus infection in swine,** H. R. SCHWARZE (*Amer. Jour. Vet. Med., 14 (1919), No. 2, pp. 51–54*).—The author reports upon eight cases investigated, both clinically in the field and bacteriologically at the State laboratory at Springfield, Ill.

"Taking into consideration the post-mortem findings, the demonstration of swine plague and hog cholera in a large percentage of the cases, and the results from bacterin treatment, it would seem that necrobacillosis, where the lesions are internal, especially of the lung and intestines, is a secondary disease following swine plague and hog cholera. However, the local necrobacillosis, such as bull-nose, necrotic stomatitis, canker of the feet, etc., may be a local lesion primarily due to some abrasion of the skin or membranes, the necrophorus bacilli and other ubiquitous organisms gaining entrance in that way causing tissue necrosis."

**Hog cholera and the swine industry,** U. G. HOUCK (*Amer. Jour. Vet. Med., 14 (1919), No. 9, pp. 461–465*).

**Ascarid infestation in swine,** H. B. RAFFENSPERGER (*Amer. Jour. Vet. Med., 14 (1919), No. 8, pp. 433, 434*).—This is an address delivered before the Illinois Veterinary Medical Association in July, 1919, in which the author presents data based upon investigations by the Bureau of Animal Industry, U. S. Department of Agriculture.

In considering the incubation of the egg of this ascarid it is stated that it will develop to the infective stage in about three weeks at a temperature of 71° to 77° F., and in about two weeks at a temperature of about 90°. The mortality from infestation with the lung stage is greatest, especially in suckling pigs, at the age of two to six weeks. In investigations made to determine the effect upon pigs, one that survived infestation out of a litter of seven weighed 33 lbs. 30 days after the infestation, whereas each of the two control pigs weighed 65 lbs. Older pigs becoming infested stand a better chance of recovery.

**Recurrence of horse plague** (*Amer. Jour. Vet. Med., 14 (1919), No. 10, pp. 494, 495, figs. 3*).—An outbreak of so-called forage poisoning or epizootic spinal meningitis in the Arkansas Valley in western Kansas and eastern Colorado is said to have resulted in the loss of a large number of animals. A brief statement by A. T. Kinsley, who investigated the outbreak, is presented.

**Cerebro-spinal meningitis of the horse in Argentina** (*Vet. Rev., 3 (1919), No. 3, pp. 294–296*).—This is a review of papers on the subject by Lignières, Bossi, and Flores, respectively.

**Contribution to the clinical study of glanders in the mule,** CABAYÉ, COLLE, and LAMARQUE (*Rev. Gén. Méd. Vét., 28 (1919), No. 326, pp. 65–70; abs. in Vet. Rev., 3 (1919), No. 3, p. 288*).—Post-mortem examinations made of some 500 glandered mules and mallein tests of some 10,000 remounts in a Greek depot led the authors to conclude that there are two forms of glanders in the mule, namely, acute and chronic.

**A preliminary note on a new coccidium of rabbits,** E. A. BRUCE (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 6, pp. 620, 621*).—The author reports briefly upon a new coccidium (*Eimeria* sp.) which infects the intestinal tract of the rabbit in British Columbia. It is especially pathogenic for very young rabbits, often causing the loss of a whole litter. Mature animals are affected, but appear to suffer no ill effects and may carry coccidia for several months. It differs from previously described forms "in the extreme variation of the size of its oocysts, the pinkish orange color of its larger oocysts, the excessive formation of material for the oocyst wall, the pink color of its sporozoite nucleus, and the presence of a very well-marked globular residual body."

**Klein's fowl plague,** H. VAN STRATTEN and B. J. C. TE HENNEPPE (*Folia Microbiol. [Delft], 5 (1918), No. 2, pp. 103–125, fig. 1*).—The authors discuss the disease caused by *Bacillus gallinarum*, which is of more importance to the poultry industry in Holland than is fowl cholera, causing great losses in some localities.

## RURAL ENGINEERING.

**Ground water in the San Pacinto and Temecula Basins, Cal.**, G. A. WARING (*U. S. Geol. Survey, Water-Supply Paper 429 (1919), pp. 113, pls. 14, figs. 15*).—This paper was prepared in cooperation with the State of California.

The San Jacinto Basin is an area of 1,000 square miles in southern California, the topography of which is diverse. The ground water of the basin "is derived wholly from the rain and snow that fall on its surface. . . . The ground water is stored almost entirely in the deposits of sand and gravel that underlie the valleys. In some places the lowlands are bordered by partly consolidated sediments which yield small quantities of water, but the underlying granitic and other crystalline rocks contain very little water, even for the supply of domestic wells."

The Temecula Basin is drained in its western part by Murrieta Creek and in the east by Temecula River. "Throughout the lowland of Murrieta Valley the ground-water level is within 20 ft. of the surface, and beneath the greater part the depth to water is less than 10 ft. . . . The sampled well waters from Murrieta Valley range in quality from fair to good for domestic uses and for irrigation. . . . In the lowland along Murrieta Creek for two or three miles above Temecula, the ground-water level is within 6 or 8 ft. of the surface, and the continual evaporation from this moist area has caused the concentration of alkali. Chemical examination of the waters tested indicates that in most of them sodium is the predominant base. . . . Throughout the lowland of Temecula Valley proper ground water is found within 20 ft. of the surface, and in the wide sandy flats of its upper portion is less than 10 ft. below the surface. . . . In the minor valleys in the upper part of the Temecula Basin, water is generally found relatively near the surface in the alluvial and residual materials." Analyses of samples of water from a shallow and a flowing well in the area and from Temecula River showed that "the waters from both wells are suitable for domestic use, but the river water is only fair because of its rather high total solids and its hardness. It is also classed as fair for irrigation."

Pumping tests made at six irrigation plants in San Jacinto Valley by Herman Stabler are also reported, together with a description of each plant. Data on the total cost per acre of pumping water for a season of 200 days of 12 hours with duty of water at 3 acre-feet per acre show that the cost per acre that can reasonably be expected in the irrigation of alfalfa with distillate at 10 cts. per gallon is $9.64. "By continuous operation throughout the irrigating season the cost could be still further reduced to $7.56 per acre with distillate at 10 cts. a gallon."

**Influence of forests on water power supply**, A. A. GRIFFIN (*Jour. Electricity, 42 (1919), No. 6, pp. 268–270, figs. 5*).—Studies of snow melting on the Tumalo area in central Oregon, the Wind River area in southern Washington, and the Yakima area in central Washington are reported.

It was found that drifting of snow by the wind was of comparatively small importance. It was also found that the retardation of snow melting in forests is five to eight days in general and may be several weeks, and that in the forest the snow tends to be deepest and last longest in the small openings of the denser forests. "This tendency was especially noted on the Wind River area and may partly account for the late melting of the snow in the small open areas characteristic of the Tumalo area. In large openings the protecting influence from the forest would be dissipated and melting consequently more rapid. An unusual factor in delaying the melting within the Douglas fir type of forest

is the protection given by the irregular layer of even very slight bits of moss, twigs, bark, and other litter weathered from the trees. . . . An opposing influence appears in the ability of the brushes, tree trunks, and other large objects to hasten melting by radiating or reflecting into the snow the heat which they receive from various sources. . . .

"Expressed in irrigation terms, the figures given mean that on the areas studied the average square mile of forest cover retained the equivalent of between 720 and 160, averaging 400, acre-feet of water in the form of snow after the open areas had become bare. . . . In terms of time, the effect of the forests was to spread the 400 acre-feet of retained snow through a period averaging 17 days in length. The retardation of this amount of snow is sufficient to be of great importance to irrigation interests, especially as it is generally understood that a forest cover tends to 'flatten out' the crest of a flood and thus to increase the minimum flow at periods of low water."

**Irrigation of lowland moor soils,** M. Oehme (*Jahrb. Moork., 3–5 (1914–1916, pp. XXVII–XXXIX*).—Five years' experiments on a moor soil growing grain are reported. Irrigation by flooding from a reservoir and furrow irrigation were practiced. The plats were unfertilized, fertilized with potash or phosphoric acid alone, or completely fertilized.

It was found that the best crop results were obtained in four out of five years on the unirrigated plats which were completely fertilized. On the irrigated plats furrow irrigation gave better results than flooding. Irrigation added only a very small amount of plant nutrients to the soil.

A second set of four years' experiments with soil tanks in which drainage and ventilation of the soil were controlled gave similar results as far as irrigation affected crop yield. A third set of four-year experiments on a low-lying moor soil showed that the best results were obtained with complete fertilization and spring irrigation.

It is concluded that irrigation of lowland moor soils in general gives unfavorable results, except where under normal conditions plenty of water containing considerable plant nutrients is available and the soil is well drained naturally.

**Drainage of lands under irrigation,** D. G. Miller (*Proc. Iowa Engin. Soc., 30 (1918), pp. 28–38*).—This is a brief summary of the important general features to be considered in the planning of drainage systems for irrigated lands.

**Some engineering methods used in the construction of tile drainage districts,** D. P. Dale (*Proc. Iowa Engin. Soc., 30 (1918), pp. 39–47*).—A brief outline of methods is given.

**An investigation of tests of Iowa shale draintile,** W. J. Schlick (*Iowa Engin. Expt. Sta. Bul. 49 (1918), pp. 71, figs. 18*).—Investigations (1) to determine the best method of making actual accelerated freezing and thawing tests upon draintile, (2) to study the effects of such tests upon Iowa tile, (3) to determine the best method of making absorption tests, and (4) to discover the relations between the results of the freezing and thawing tests and the absorption and strength tests, are reported. The investigations were confined to hard burned and soft burned shale tile from four representative Iowa factories, together with a few concrete tile.

It was found that "Iowa shale tile such as were included in this investigation will withstand 100 freezings and thawings without excessive deterioration when the absorption obtained by the standard boiling test does not exceed 9 per cent. All of the tile tested met the freezing and thawing requirements of the American Society for Testing Materials for 'extra quality' draintile with the exception of a certain 8-in. soft tile from one factory, which had a very high percentage of absorption.

"The percentage of absorption obtained by immersion in water below the boiling point increases as the temperature of the immersion water decreases. This is true both in cooling after the boiling test and in the regular immersion test. The variation in the percentage of absorption due to this cause is usually noticeable, but it is not in constant ration to the temperature change and is nearly always small; it is large enough, however, to make it advisable that the temperature of the water in all absorption tests should be specified.

"The principle does not apply to immersion in boiling water. It was found that there is a definite and fairly constant ratio between the results of the recommended standard boiling test for determining absorption and those of the absorption test by 72 hours' complete immersion in water at room temperature. The average of a large number of determinations made in this investigation indicates that for Iowa shale tile the percentage of absorption by the recommended standard boiling test is approximately 1.4 times that after 72 hours' complete immersion in water at room temperature. The boiling absorption test is to be preferred to the immersion absorption test. The boiling absorption test has been adopted as standard for draintile by the American Society for Testing Materials, and all absorption tests of draintile should be made in strict compliance with sections 21 to 25, inclusive, of the 'Standard Specification for Drain Tile.'

"In these tests, as in many others, it was found in general that the strength increased as the absorption decreased. This relationship was clearly apparent in the case of tile with widely different strengths and absorptions, but was obscured by other factors where the range in either strength or absorption was small. It is now very generally recognized that draintile from several factories can not be judged correctly by a single color standard. It is almost as generally believed that the product of a single plant, while using the same methods and similar clays, may be judged correctly by color. This is upon the assumption that, with the same clays treated in the same manner, the quality of the product will depend upon the burning, and that this will be indicated very clearly in two cases, that this rule will not apply even to the product of a single factory unless the full history of the manufacture of the product is known and considered.

"The best method for making freezing and thawing tests of draintile is that prescribed in sections 26 to 31, inclusive, of the Standard Specifications for Draintile of the American Society for Testing Materials. The above method is similar to that used in the 'final' artificial freezing and thawing tests reported . . . and produces much more decisive results than those obtained in 'preliminary' tests. Sodium sulphate tests by the 'recommended method' developed in this investigation gave results approximating those obtained by three times as many standard freezing and thawing tests."

**The sampling of deposits on road stone and gravel in the field,** L. REINECKE and K. A. CLARK (*Amer. Soc. Testing Materials Proc., 18 (1918), pp. 393–415*).—This is a preliminary report on a series of studies upon variations in the road-making qualities of deposits of bedrocks, bowlder aggregates, and gravel.

The investigations on bedrock showed that "the results of an abrasion test expressed as percentage of wear are liable to an error of 0.2 per cent due to variations caused by laboratory procedure. No additional error is introduced into the results of abrasion tests by the process of sampling when samples are collected in the manner outlined. Results of abrasion tests on rock in place in a deposit represent, within a probable difference of 0.4, the percentage of wear that will be shown by a crushed product produced from the deposit. In the case of deposits consisting of stone of a very uniform character and appearance, the results of abrasion tests on samples taken at one

point in the deposit can be regarded as representing within the probable error due to laboratory manipulation the percentage of wear of the stone over quite a considerable area, at least a quarter of a square mile. It is possible to assign average values and fairly narrow limits of variation of this value for the percentage of wear and the toughness of the material occurring in a limestone formation covering areas up to 50 and 60 square miles and with thicknesses up to 500 ft., even though stone varying in character is included in the formation. These values and limits will include the majority of results of tests made on samples collected throughout the formation and its various horizons. . . . The results of abrasion and toughness tests over a series of diabase dikes of the same age and structure reveal very uniform results in deposits of the same grain. A change in the average size of grain affects the toughness value slightly."

In the investigation on bowlder aggregates it was found that bowlder deposits in any one area consist of many combinations of three or four rock types of fairly uniform durability, and that the percentage of wear of any combination of the rock types found in deposits of bowlder aggregates could be calculated by the following formula if the percentages of wear of each of the rock types were known:

$$W_m=\frac{\Sigma CW}{100},$$

in which $W_1$, $W_2$....$W_m$=percentages of wear of the various rock types, and $C_1$, $C_2$....$C_n$=percentage proportions in which the rock types are present in the combination.

In the sand and gravel investigation a large variation was found between the results of duplicate granulometric laboratory analyses on the same sack of gravel. The variation in texture over one deposit of gravel of 800 acres was found to be large.

**An abrasion test for stone, gravel, and similar aggregates,** H. H. SCOFIELD (*Amer. Soc. Testing Materials Proc., 18 (1918), pp. 416–428, figs. 7*).—It has been found that the standard Deval test for road materials is somewhat misleading in its results due to the retention within the abrasion chamber of the dust worn from the charge. An apparatus is described which was devised at Purdue University, to fill the need of a rapid and practical abrasion test for road materials which is simple in construction and allows the dust of abrasion to escape. The machine is a small type rattler in which dust and chips from abrasion escape between the staves as fast as formed. The opening between staves is $\frac{1}{16}$ in. The abrasion chamber is octagonal in shape with a volume equivalent to that of the Deval cylinder. Recent tests with this apparatus upon 12 Indiana limestones show in general that the new test gives a greater range of results and a consequent better differentiation of quality.

**Effect of controllable variables on the toughness test for rock,** F. H. JACKSON, JR. (*Amer. Soc. Testing Materials Proc., 17 (1917), pp. 571–588*).—Studies on the effect of certain controllable variables on the accuracy of the toughness test for rock for road building are reported.

It was found that "the quality of the product of a rock quarry may vary from time to time to such an extent that it is advisable to test the material, as nearly as possible, at the time it is to be used. Great care should be exercised in selecting samples for the toughness test in order to insure obtaining an average value for the toughness of the entire product. All materials exhibiting any indication of foliation or bedding should be tested in two directions; one set perpendicular and the other set parallel to the foliations. A greater total variation than 1 mm. in either the diameter or height of the test specimen should not be allowed. Variations in the moisture content of test specimens

affect the results very little, although for purposes of uniformity it is recommended that all specimens be dried out prior to testing. Very accurately prepared bearing surfaces are essential if reliable results are to be expected. The effect of vibrations of the plunger and secondary blows produced by the rebound of the hammer during the progress of the test are apparently negligible."

**Tests of concrete road aggregates**, J. P. NASH (*Amer. Soc. Testing Materials Proc., 17 (1917), pp. 394–421, figs. 12*).—In studies of the causes of deterioration of concrete in roads, tests were conducted on concrete, using various coarse aggregates, including wear and tension tests. The conclusions drawn from these tests are as follows:

"Uniformity of wear is obtained when the mortar and the coarse aggregate wear equally, such as when crushed limestone or limestone gravel is used in a 1:2:4 mix. The coarse aggregate should be limited in size to about 1.5 in. When hard, tough stone is used, the size should be limited to about 1 in. and the cement content increased. It is questionable if a richer mix than a 1:2:4 is an economical one to use with crushed limestone of the ordinary hardness. Crushed slag when hard and uniform should be satisfactory as a concrete road aggregate from the standpoint of wear. In a 1:2:4 concrete, a gravel composed of very hard stones such as flint, or quartz, does not wear uniformly. The action of the cubical shot on the test specimens is a trifle more severe than the traffic on the road. It can not be said that either the crushed stone or gravel tested is superior as an aggregate to produce concrete having a higher tensile strength."

**A new consistency tester for viscous liquid bituminous materials**, P. HUBBARD and F. P. PRITCHARD (*Amer. Soc. Testing Materials Proc., 17 (1917), pp. 603–626, figs. 8*).—In attempting to devise a convenient laboratory instrument for determining consistency at normal temperatures, the authors followed the general principle of the Lunge and Hutchinson tar testers with a view to improvement in certain important details. After numerous trials an instrument was obtained made of aluminum and weighted with lead shot.

The instrument is 3 in. long and weighs exactly 2.8 gms. It consists of two aluminum rods of different diameters one of which is hollow, a thin aluminum disk 1.25 in. in diameter, and a tapered bottom weight. The larger rod is about one-half the length of the smaller which passes through it and screws into the bottom weight. The aluminum disk is riveted transversely to the rods where they join about midway of the length of the instrument thus forming a balanced plummet.

A special bitumen container is used with this instrument. It consists of a cylindrical flanged copper cup 2 in. in diameter and 3.75 in. deep, which is placed in a water-bath fitted with a stirrer passing through the flange of the cup. The flange is also provided with a small hole for the insertion of a thermometer in the bath.

Before making a test, the bituminous material which fills the inner compartment of the water-bath is brought to a temperature of exactly 25° C., which must be maintained in the bath throughout the test. The surrounding atmosphere should also be as close to 25° as possible. The test is made by allowing the instrument to sink of its own weight in the bituminous material from the upper edge of a lower scale marking on the small rod to that of an upper marking, and noting the time required.

This instrument was found to have a wide range of usefulness, as shown by numerous tabulated test results. At normal temperatures it may be used for all bituminous materials outside of the range of the Engler viscosimeter and the usual penetration machine. When used in connection with a representative

set of commercial bituminous road materials, it was found that comparatively few materials whose penetration at 25° could not be ascertained required more than 30 minutes for a test with the new instrument. Most of the material prepared for hot-surface treatment showed a test of less than 15 minutes.

**Progress reported on wood-block experiments in Minneapolis**, C. H. TEESDALE and J. D. MACLEAN (*Engin. News-Rec., 82 (1919), No. 5, pp. 233, 234, fig. 1*).—The results of an investigation made on an experimental wood block pavement after 12 years' service under heavy traffic conditions are reported. The purpose was to study the relative merits of various species of wood for paving material and to investigate the influence of (1) heartwood and sapwood, (2) length of blocks, and (3) angle of courses. Seven species of wood were employed—including tamarack, Norway pine, long-leaf pine, white birch, Douglas fir, western larch, and hemlock. The long-leaf pine was used as a basis for comparison.

It was found that the order of efficiency of service was as follows: (1) Long-leaf pine, (2) white birch, (3) eastern hemlock, (4) tamarack, (5) Norway pine, and (6) western larch. The depressions and wear of Douglas fir were from two to three times as much as those of the long-leaf pine portion laid at the same time. For most of the species the depressions were very slight during the first four or five years' service. After this period the depressions increased at a very rapid rate. Certain sections showed wearing qualities of Norway pine which compared favorably with those of long-leaf pine and white birch. The western larch sections had the greatest percentage of area affected by depression. This was also one of the species which showed the heaviest wear. The order of the species, beginning with that showing the least wear, was as follows: White birch, long-leaf pine, Norway pine, tamarack, eastern hemlock, and western larch.

The presence of sapwood did not seem to be an important factor affecting the durability of the pavement. The various lengths of blocks employed had no apparent influence on the wearing qualities of the pavement. Less joint wear was noted in sections laid at 45 and 67½° than in the section of blocks laid at an angle of 90° with the curb.

**Distribution of pressures through earth fills**, A. T. GOLDBECK (*Amer. Soc. Testing Materials Proc., 17 (1917), pp. 640–661, figs. 9*).—The object of this investigation was to obtain data on the distribution of vertical pressures through earth fills under concentrated loads, with particular reference to the design of highway structures. Sand fills were investigated up to a depth of 5 ft. and the pressures under them measured with a special diaphragm cell. The principles of pressure measurement with the use of this instrument depend upon (1) the equilibration of the soil pressure with air pressure within a small cell buried where the pressure is desired, (2) the detection of the instant of equilibration by the breaking of electrical contact within the cell, and (3) the measurement of the air pressure within the cell at the instant of equilibration by the use of a sensitive gauge.

**The cost of farming with a tractor** (*Farm Machinery, No. 1446–1447 (1919), pp. 25, 26, 84, 86, 88, figs. 3*).—This is a report in detail of a 310-hour run of a tractor in harvesting 127 acres of wheat, thrashing the grain, disking 34.5 acres of land, and plowing all of it. This test is considered to simulate a season's work for the tractor.

The total cost per acre for fuel and oil in harvesting was 14.5 cts., for thrashing 14.32 cts., for disking 10.84 cts., and for plowing 47.06 cts. Out of the total operating time of 310 hours and 9 minutes, 7.2 per cent was lost on account of implement trouble and 3 per cent on account of tractor trouble. It was found that the tractor was better than horses for opening up a field of wheat for

cutting. While the plowing was the hardest operation, this was the best performance, as the outfit averaged an acre an hour. It was also found that the operator is one of the most important factors in the operation of a tractor on account of the carelessness factor.

Common tractor troubles, H. H. FENTON (*Kans. Agr. Col. Ext. Circ. 13 (1919), pp. 12*).—This circular outlines tractor troubles and their remedies.

A common-sense farm home, L. J. SMITH (*Canad. Thresherman and Farmer, 24 (1919), No. 8, pp. 36–38, figs. 2*).—The author presents a farmhouse plan in which it has been endeavored to secure a well-arranged interior together with an attractive exterior. This plan is based on Manitoba conditions.

Plans for the construction of a privy for use in towns and villages ([*Bien.*] *Rpt. Bd. Health Miss., 1916–17, pp. 359–372, pl. 1, figs. 3*).—General information, drawings, and specifications are given on sanitary privy construction, with special reference to types from which the receptacles are removed from the inside or outside.

## RURAL ECONOMICS.

Farm leases in Kansas, W. E. GRIMES (*Kansas Sta. Bul. 221 (1919), pp. 32, figs. 9*).—Data are presented which were gathered in 1914, 1915, and 1916 by surveys of farms in eastern and central Kansas. It is stated that in 1910, 36.8 per cent of all farms in the State were operated by tenants, and eastern counties had more tenants in proportion to the total number of farmers than western counties.

A comparison is made of farm business and practices of owners and tenants to show their successes as operators in matters of profits from crops and live stock, crop yields, and rates of interest and terms of loans granted them. It is shown that tenants' labor incomes were higher than owners', that the owner's interest on investment was greater than the landlord's rent, and a smaller labor income to the owner than to the tenant resulted. Owners kept at least one-third more live stock than tenants, and tenants' live stock returned relatively less than owners', one of the most important reasons for which was that landlords limit the area of pasture and feed crops as much as possible. Crop yields on farms operated by owners were on the whole higher than on tenant farms, and the yields on tenant farms tend to further depression under present methods of leasing. The tenants paid from 1 to 2 per cent more interest than the owners, and they borrowed for much shorter terms.

Undesirable economic and social conditions developed on rented farms are discussed. Comparisons of the methods of renting in common use indicate the following advantages and disadvantages: Cash renting is least profitable to both landlord and tenant. Crop-share renting is the most common method and more profitable than cash renting to both landlord and tenant. Stock-share renting is less frequently used, but produces more desirable conditions than any of the other methods. The author's suggestions for methods of improving leases in Kansas are by a wider adoption of the stock-share lease, elimination of absentee ownership of land, providing better methods of maintaining soil fertility of farms rented for cash or for a share of the crops, and improved credit facilities and the provision of better opportunities for acquiring ownership.

The evolution of share renting during a hundred years, A. M. DES ROCHETTES (*Jour. Agr. Prat., n. ser., 32 (1919), No. 25, pp. 505–507*).—This article briefly describes the stipulations in contracts of métayage, a system of share renting peculiar to France, and shows that the advantage to the renter has been consistently greater through the period from about 1810 to the present.

Evolution in rural life; scientific cultivation, C. BLANCHARD (*L'Evolution dans la Vie Rurale—La Culture Scientifique. Macon [France]: X. Perroux & Son, 1919, pp. 54*).—The evolution and manner of land ownership and exploita-

tion in France are briefly described in the first part of this pamphlet, and in the second, principles of scientific management. The author favors collectivism in agriculture and maintains that it may be fostered by agricultural education and organization.

**Report by the Scottish Land Court as to their proceedings under the Small Landholders Acts, 1918** (*Rpt. Scot. Land Court, 1918, pp. XX+141*).—Special orders of the court in matters of cultivation of, improvements on, and tenure of small holdings, a summary of statistics, and appendixes showing details of the work of the court and the principal judgments issued are included in this report.

**Military agricultural colonies in southern Albania,** C. MANETTI (*Agr. Colon.* [*Italy*], *13* (*1919*), *Nos. 2, pp. 92–125; 3–6, pp. 147–153, pls. 4*).—This article describes the topography, climate, native vegetation, and principal crops in the region of Argyro-Castron, and the progress of military agricultural colonies and experimental plats recently established there.

**Soldiers' settlements in Queensland,** J. M. HUNTER (*Brisbane: Govt.*, [*1918*], *pp. 5, pls. 5*).—The supervisory organization for soldiers' settlements is described, and the areas set aside for this purpose and improvements under way are reported upon.

**Agriculture and the war,** P. PERREAU PRADIER (*L'Agriculture et la Guerre. Paris: J. B. Baillière & Sons, 1919, pp. 220*).—The author reviews agricultural development in France, and shows the immediate effects of the war in decreasing production, increasing cost of labor and fertilizers, and in causing loss of live stock; also in the stimulus given to the rearrangement of parcelled holdings, cultivation by motor power, rural credit and cooperation, and to State aid in furnishing agricultural labor. He then devotes his discussion to the need of repopulation of rural districts and agricultural education for the rural public.

**Land, the restorative,** ROQUETTE-BUISSON and M. A. HÉRUBEL (*La Terre Restauratrice. Paris: Payot & Co., 1919, pp. 240*).—The author discusses the present food needs of the world, the principal world markets, food restrictions in several countries during the war, the necessity of equilibrium in the economic development of any nation, the industrial ambitions of nations, and their attempts to conquer markets. He maintains that the problems that France is facing are the need of assembling scattered agricultural holdings, organization for acquiring agricultural capital, checking the rural exodus, providing technical education, and intensive cultivation of the land. He describes the needs for and functions of a rural party.

**The problems of national reconstruction** (*Montreal: Standing Com. Plans and Propaganda, Canad. Natl. Reconstr. Groups, 1918, 2. ed., pp. 71*).—In this pamphlet is published an outline for discussions to be held in Canadian National Reconstruction Groups. It is intended to be preliminary to a report on Canadian reconstruction policy. One chapter relates to land and agriculture. Recommendations submitted are stated to be based on Canadian public opinion and on literature, largely of British origin, which is listed in the appended bibliography.

**Agricultural reconstruction,** J. LONG (*Jour. Bath and West and South. Counties Soc., 5. ser., 13* (*1918–19*), *pp. 6–21*).—The author describes the way in which necessary increased food production in England depends upon the increase of the arable area, the extension of small holdings and allotments, the increase in the number and quality of live stock kept upon improved uplands, minimum prices for corn, the compulsion of landowners and farmers who are not already doing their duty by the land, the establishment of open markets for the sale of farm produce, the establishment of farm schools for the training of the sons of small farmers at nominal fees, and the reconstruction of village life.

**The economic revival of Italy**, L. Marchetti, trans. by M. Sindici (*Turin, Italy: Unione Tipografico-Editrice Torinese, 1918, pp. 91, pls. 7, figs. 20*).—This describes the production of wheat, corn, rice, wine, special export products, and raw materials, and other phases of Italy's agricultural industry. Recent developments of Italian manufacturing and commerce and Italy's problems of finance are described and illustrated, and the fact is brought out that the nation is undergoing a transition from an agricultural to an industrial economy.

**Russia: Her economic past and future**, J. M. Goldstein (*New York: Russ. Inform. Bur., 1919, pp. 99+IV, pls. 4, figs. 65*).—The author states that the capital invested in industry in Russia was very insignificant under the bureaucratic régime, and that not until local self-government bodies, created after the liberation of the peasants, learned that subsidies were indispensable to the economic development of a country did agricultural industries show any marked progress. He shows by means of numerous diagrams Russia's production of grain foodstuffs, rôle in the world market, cattle raising, industrial production, foreign trade, principal items of export and import, grain elevators, etc., in comparison with that of other countries, particularly with the United States. The study includes also a survey of canals, ports and their trade, and railroads, with proposed improvement and expansion. Russian banking and its recent development are described and illustrated to emphasize the extent to which capital was being invested in Russian enterprises just prior to the war. The purpose of this study is to urge the strategic necessity to Russia of the investment of capital there by the Allies, and particularly by England and the United States.

**Agricultural extension in Spain**, G. F. de la Rosa (*Bol. Agr. Téc. y Econ., 9 (1917), Nos. 106, pp. 925–935; 107, pp. 981–993; 108, pp. 1086–1098*).—The author discusses past efforts at agricultural federation in Spain and proposes the establishment of institutes for agricultural extension, one for each of the several districts into which the country would be divided. He suggests that the functions of these bodies should be the determination by a survey of geographic, meteorological, and economic conditions of the local needs of their respective communities, and the adaptation to those needs of lectures and demonstrations.

**[Rural credit, cooperation, and insurance in the Philippines]** (*Philippine Agr. Rev., 12 (1919), No. 2, pp. 60–68*).—The status of 82 rural credit associations is indicated in a table showing the distribution, capital stock, and capital paid at incorporation. A report is made of the work of these associations, services of rural credit agents, and results of organization of this type. Projects under the direction of the cooperative organization and cooperative marketing sections of the Philippine Bureau of Agriculture and the activity of the Animal Insurance Board in securing data concerning the local market value of work animals preparatory to administering the Work Animals Insurance Act are also described.

**A study of the origins, the functions, and the achievements of agricultural syndicates**, E. Damecour (*Etude sur les Origines, l'Action et les Œuvres des Syndicats Agricoles. Coutances, [France]: J. Bellée, 1918, pp. 37*).—The functions of French syndical societies for purchase and sale, education, credit, insurance against live-stock loss, fire, and accident, and establishment of pension funds are described.

**[Classification principles and results as regards necessary agricultural and industrial workers]** (*War Dept. [U. S.], Rpt. Provost Marshal Gen., Oper. Selective Serv. System, 2 (1917–18), pp. 135–147, 159, 407, 419*).—A description of the system of deferments and furloughs, with selections from the Selective Service Regulations and the War Department General Orders, is given.

It is shown that deferments, as necessary workers, of men engaged in agriculture were 7.19 per cent of those classified as compared with 1.96 per cent of industrial workers. A comparison of rural and urban physical rejections shows 21.68 per cent of those examined rejected in urban regions as against 16.89 per cent rejected in rural regions. This, and data in one of the appendixes giving a percentage comparison of rejections by disqualifying defects for eight urban and eight rural districts covering 45,000 rejects, nearly equally divided between city and country, indicate the physical advantage of the boy reared in the country.

**Maternity and infant care in two rural counties in Wisconsin**, F. B. SHERBON and E. MOORE (*U. S. Dept. Labor, Children's Bur. Pub. 46 (1919), pp. 92, pls. 11*).—This report describes economic and social conditions and topography and types of farming in two counties in which surveys of a limited number of townships were made covering two main topics: The conditions affecting the health of the childbearing mother and the care—especially the feeding—and survival of the babies. The report is based upon information concerning 614 families who live in these selected districts, 453 in the northern and 161 in the southern county.

It was found that the infant mortality rate in the northern county was low compared to the average for the United States birth registration area. The stillbirth rate was somewhat higher than the rates found for six of the eight cities in which infant mortality studies have been made, and the death rate of mothers from causes connected with childbirth was high. Many births were attended by midwives in certain sections of this territory; a proportion as high as four-fifths was found in one of the Polish settlements.

In the southern county the infant mortality rate was higher than in the northern county, but the stillbirth rate was lower. Only one mother had died at childbirth. Practically all the births were attended by physicians.

In neither district were the housewives on the farms obliged to provide for large crews of hired men at any special season. Birth registration proved to be defective in both districts, especially the northern.

**Monthly Crop Reporter** (*U. S. Dept. Agr., Mo. Crop Rptr., 5 (1919), No. 9, pp. 85–96, fig. 1*).—In this are presented the usual data relating to estimated farm value of important products August 15 and September 1; average prices received by producers in the United States, and the range of prices of agricultural products at important markets; the United States crop summary for September 1; statistics on the condition and forecast on September 1, with comparisons, of corn, spring wheat, oats, barley, potatoes, sweet potatoes, tobacco, rice, wild and tame hay, clover for seed, timothy, alfalfa, millet, pasture, buckwheat, flaxseed, apples, peaches, pears, grapes, watermelons, cantaloups, sorghum for sirup, sugar beets, peanuts, beans, grain sorghum, broom corn, field peas, tomatoes, cabbage, onions, hops, and cranberries; also detailed estimates of the acreage of commercial cabbage, 1919, with comparisons, and of beans by varieties, the total number of stock hogs in the United States September 1, 1919 and 1918, honeybees and honey plants, the production of wool, with comparisons, commercial acreage harvested and total production of late onions, 1918, and of acreage planted, 1919; a cotton report for August 25; and reports of pecan conditions September 1, and numbers of live stock and live-stock changes. Index numbers of crops and live-stock prices are given; combined monthly receipts of hogs since January, 1914, at twelve important markets are tabulated; and various data relating to crop conditions, with an illustration of composite crop conditions of all crops, and miscellaneous special articles are included.

Prices and supplies of grain, live stock, and other agricultural produce in Scotland (*Agr. Statis. Scot., 5 (1916), pt. 3, pp. 80–109*).—Information previously noted (E. S. R., 40, p. 194) is continued for 1916. The prices of fertilizers and feeding stuffs are shown for the first time.

## AGRICULTURAL EDUCATION.

Materials for a policy of agricultural education, H. M. Leake (*Agr. Jour. India, 14 (1919), No. 1, pp. 1–20*).—Continuing a previous discussion (E. S. R., 40, p. 601), proposals are outlined for constituting a scheme for providing for the educational needs of the largest section of the community in India. This the author thinks will suffice for the main educational function, namely, that of fitting the average youth for a useful and contented life in the conditions under which he was born.

He finds that education in India fails in two directions, viz, practicality and accuracy. In the government grants for educational development, which are largely devoted to the erection of new school buildings, too much attention is given to the number of schools teaching a standard curriculum and too little to that improvement of the pay and prospects of teachers, which alone will attract a better class to the profession and thus remove the necessity for that rigid standardization which stultifies individual initiative.

Two aspects of the educational problem in India are considered, namely, the insignificance of the system as compared with the individual and the provision of a ladder by which those intellectually qualified can rise. In discussing the functions of the agricultural college the author states that these will be fulfilled only when the main source of recruitment is the zemindar class, a class relatively small, perhaps, but numerically large and potentially powerful. The college must also supply the agricultural teachers for the secondary schools.

For the education of the masses there is found to be need for a cheap form of secondary education, complete in itself and complete within the limits provided by the age at which the average boy leaves school. The primary object of such a school will be to raise the receptivity of the younger generation of agriculturists, and the method of attainment must be through education under conditions which retain the association of the land. The author describes his conception of the organization of such a school in its environmental and educational aspects.

The school is represented as a village, the unit of communal life, composed of families, the unit of private life. The school will have approximately sufficient land to provide for each "family" of five students an area, roughly, equal to the average holding of the locality. The teacher will assume the rôle of the zemindar and his agents. This organization is compared with one of the few existing vernacular agricultural schools, in which the form of education provided is deemed too expensive and the admission requirements too high for the mass, and which also attempts instruction suited to collegiate students.

Attention is also called to the difference between the proposed type of school and vocational schools whose main function is to impart technical skill and in which theory is taught only in so far as it bears on the particular trade. In the former, subjects bearing upon the education may be taught but only for their internal value as a means of education, and the practical application is left to be drawn by a process of natural inhibition in the daily life. It is here, the author thinks, that the efforts which have been made to introduce agriculture into existing schools have failed. The practical difficulties, not the least of which is the lack of qualified teachers, are such that

the development of the proposed schools must be slow and will afford ample opportunity for gaining useful experience.

**The organization of public professional instruction in agriculture in France** (*Vie Agr. et Rurale, 8 (1918), No. 37, pp. 182–184*).—The text of the law of August 2, 1918, on the reorganization of public professional instruction of agriculture in France is given. A new depature under this law is the establishment of sections or departments of practical agriculture on the estates of the national schools of agriculture at Grignon, Montpellier, and Rennes, at the National Agricultural Institute, and the National School of Agricultural Industries, to provide a thorough practical training for students leaving the National Agricultural Institute who wish to take up an agricultural career or to become professors of agriculture. Students from the national schools of agriculture and special students may also attend these departments.

In view of the poor results obtained by running the farms in connection with some of the practical schools of agriculture on a commercial basis, so that the director-farmer, obliged to make the greatest possible profit out of the farm, looked upon the students as laborers rather than real pupils, it is provided that farms in connection with the schools, save in exceptional circumstances, will be run either on behalf of a commune, a department, or the State. Winter or seasonal agricultural schools, either fixed or traveling, and under the control of the minister of agriculture, are to be established throughout the country with the joint financial support of the minister of agriculture and the department or commune.

Continuation instruction in agriculture is provided for, either in public schools or in premises placed at the disposal of the State by a commune or private persons. The instruction will be given to boys 13 years of age and over, and will extend over at least four years with a minimum of 150 hours each. A certificate will be awarded on the completion of the course.

A permanent central commission of the ministry of agriculture is also established, consisting of representatives of the ministries of agriculture and public instruction and of leading farmers designated by the minister of agriculture. This commission will be consulted regarding the regulations relating to continuation instruction, its general organization, and course of study, and on agricultural instruction given at the normal primary school.

Instruction in agriculture and housewifery for girls is provided for in the National Agricultural Institute, the national schools of agriculture, in connection with one of which a higher normal section for the preparation of professors and directors of schools of agriculture for women may be established, the agricultural housewifery schools which may be fixed, temporarily fixed, or temporarily traveling, and the course of continuation instruction in agricultural housewifery given to girls over 12 years of age in the public rural schools or in premises put at the disposal of the State.

**Report of the education branch for the years 1917–18 and 1918–19** (*Jour. Bd. Agr. [London], 26 (1919), No. 3, pp. 279–300*).—This report deals with the grants made for the biennium ended March 31, 1919, for educational, advisory, and research work, and with the progress made therein by the various institutions and local education authorities during the academic biennium ended September 30, 1918.

The total attendance of the institutions providing higher agricultural education is reported as 576 in 1917–18, as against 387 in 1916–17. No regular courses were given at the University of Leeds, and at Oxford practically the whole staff was absent on war work. At the 1916–17 session of the Harper Adams Agricultural College, women students were admitted for the first time to the full diploma and certificate courses. The total attendance on special and short courses in 1917–18 was 1,791, as compared with 897 in the previous year, the

increase being due to a large extent to the attendance on courses in farm work for women and on courses for disabled officers.

Brief reviews are given of the advisory work conducted at the institutions for higher agricultural education, as well as notes on the work of the research institutions. The services of a considerable portion of the staffs of these institutions were requisitioned for work under the food production department.

The schemes of agricultural instruction in the counties continued to be worked in the modified form necessitated by the war. In 1917–18, 416 organized day courses in agricultural subjects were held with an attendance of 4,989 as compared with 303 such courses with an attendance of 3,251 in 1916–17. In each of the two years 136 evening schools and classes in agriculture, horticulture, poultry keeping, farriery, and basket making were held, with a total attendance of 2,835 and 3,062, respectively. Lectures and instruction in manual processes were also given. The returns from 9 institutions providing residential courses of the farm institute type show that instruction was provided for 317 students in 1916–17 and 389 students in 1917–18.

There are at present about 40 organizers, whose duties and responsibilities are mainly to supervise all the agricultural work done by the county or counties employing them. They may give some instruction, but their main function is to act as the organizing head of the county staff and the mainspring of its activities.

Local authorities have been asked to prepare a comprehensive and satisfactory scheme of agricultural education for their areas by means of the establishment and maintenance, or contributions thereto, of an institution for higher agricultural education and of a farm institute or farm school; the provision of a county staff of agricultural instructors, including particularly the appointment of an agricultural organizer; the provision of technical advice for farmers, of regular short courses at an approved center or centers, and of local courses, lectures, practical demonstrations, etc., through the agency of the county agricultural staff or otherwise.

The grants for 1918–19 amounted to a total of $368,054.50, including $71,802.70 for universities and colleges, $35,979.20 for advisory work, $119,105.08 for research institutes and other research centers, $13,055.48 for special research and other investigations, $118,783.92 for the maintenance of farm schools, technical classes, local lectures, etc., and $418.48 for the establishment of farm schools, $43.79 for the expenses of advisory councils, and $8,865.85 for forestry advice, research, and experiments.

**Agricultural [and forestry] education and research** (*Rpt. Bd. Agr. Scot., 7 (1918), pp. XXI–XXVI, LXXIV–LXXVI*).—An account is given of the work of the three agricultural colleges, the two veterinary colleges, and extension and research work in 1917–18.

The attendance at the day classes of the agricultural colleges was 117, practically the same as for the preceding year, while that at the evening classes was 462 as compared with 337 in the preceding year. The extension work was conducted under extreme difficulty owing to war conditions. Grants of seeds and plants not to exceed £1 in value in each case were supplied to 344 schools conducting garden work.

The research work for which grants were paid from the development fund included an investigation of the economic problem of crane flies, cheese-making problems, a geological soil survey, research in animal nutrition, the production of improved varieties of potatoes and turnips, and the investigation of sheep diseases.

The activities under schemes providing agricultural and forestry training for discharged sailors and soldiers are briefly described.

# NOTES.

**California University.**—W. R. Camp, professor of agricultural economics and marketing at the North Carolina College and Station, has been appointed associate professor of rural institutions. J. P. Benson has been appointed assistant professor of agricultural extension and E. V. Jotter, assistant professor of forestry.

**Connecticut State Station.**—Miss Edna L. Ferry, who for ten years has been first assistant in the nutrition research laboratory, died October 7, 1919. Michael D'Esopo, assistant chemist in the analytical laboratory, resigned December 1.

**Delaware College and Station.**—Harry Hayward, dean and director since 1906, resigned effective January 1, to accept a commercial position in Philadelphia. C. A. McCue, head of the department of horticulture, has been appointed to succeed him. A. E. Grantham, for twelve years head of the department of agronomy, has resigned, effective February 1, to become manager of the agricultural service bureau of a fertilizer company with headquarters at Richmond, Va.

**Florida University and Station.**—J. L. Earman, chairman of the board of control, resigned July 15, 1919, and has been succeeded by H. B. Minium. J. T. Diamond of the board resigned November 10. J. B. Hodges has been elected chairman of the board.

S. W. Hiatt, district agent for North and West Florida, resigned October 1 and was succeeded by H. G. Clayton, formerly county agent for Manatee County. R. W. Blacklock, county agent for DeSoto County, has been appointed assistant boys' club agent vice L. R. Highfill, resigned September 15. B. F. Floyd, plant physiologist, resigned November 15.

**Michigan College.**—Dr. J. L. Snyder, president emeritus, died at East Lansing October 22, 1919, at the age of 60 years.

Dr. Snyder became president of the college in 1896, continuing until 1915. During this long period the student body increased from 300 to nearly 2,000, much more substantial aid was secured through the passage of the State tax law, and a home economics course, a veterinary course, and a course in forestry were established. He was for many years a prominent figure in the Association of American Agricultural Colleges and Experiment Stations, and served as its president in 1908.

**Ohio State University.**—Bids have been asked for a swine building to cost $10,000 and a sheep building to cost $15,000. These buildings will constitute the first units of an animal husbandry group to be erected under a comprehensive building plan, and will be located some distance west of the present campus and across the Olentangy River.

H. C. Ramsower, professor of agricultural engineering, has been appointed director of the agricultural extension service. A. D. Burke has been appointed instructor in dairying.

**Oregon College.**—O. D. Center, director of the extension service, has resigned to assume charge of extension work in McLean County, Ill. W. D. Pine has been appointed instructor in dairying, and H. S. Selby instructor in farm management.

Association of Official Agricultural Chemists.—The thirty-sixth annual convention of the association was held November 17–19, 1919, at Washington, D. C. The registration of 264 was somewhat smaller than at the previous meeting in 1917, but unusual interest was shown in the reports and papers and the attendance at the various sessions was very regular.

The usual reports of the referees and associate referees were read and discussed. Particular interest was manifested in the report of the sugar referee, A. H. Bryan, and accompanying papers on The Double Polarization Method for the Estimation of Sucrose and the Evaluation of the Clerget Divisor, by R. F. Jackson and C. L. Gillis, and The Attitude of the New York Sugar Trade toward the new U. S. Bureau of Standards Value for Standardizing Saccharimeters, by C. A. Browne. Prolonged discussion of the question of the Brix and Beaumé scales and of the standardization of quartz plate saccharimeters resulted in the appointment of two committees, the first to report later in the session on the Beaumé scale and the other to investigate quartz plate polarization during the coming year. Subsequently a resolution was adopted prescribing the Beaumé scale of the Bureau of Standards (Modulus 145), as given in Table 31, Circular 44, U. S. Bureau of Standards, as the official Beaumé scale of the association, and eliminating all Beaumé tables and references thereto not in accordance with this scale.

Supplementing the regular reports of the other referees the following papers were presented: The Determination of Water in Cereals and Meat Products, by F. C. Cook; Commercial Feeding Stuffs, by A. McGill; The Determination of Small Amounts of Chlorids in Chemical Reagents, by W. Heath; The Effect of Manure-Sulphur Composts on the Solubility of the Potassium of Greensand, by A. G. McCall; A Comparison of the Results obtained by the De Roode, Official Lindo-Gladding, and Modified Lindo-Gladding Methods for the Determination of Potash in Mixed Fertilizers, by E. R. Tobey; The Solubility of Calcium and Magnesium Arsenates in Carbon Dioxid and its Relation to Foliage Injury, by A. J. Patten; The Determination of Water-soluble Arsenic Oxid in Calcium Arsenate, by J. J. T. Graham; Ripe Olives, by C. Thom; Some Biochemical Characteristics of a Spinach Disease, by S. L. Jodidi; Physicochemical Methods for Determining the Grade of Flour, by C. H. Bailey; An Error in Gravimetric Vanillin Determinations in Vanilla Extracts, by H. J. Wichmann; The Cryoscopic (Freezing point) Method of Determining Percentages of Added Water in Milk, by J. Hortvet; and A Method for the Determination of Borax in Fertilizer Materials, by G. F. Lipscomb and C. F. Inman.

In the absence of C. S. Hudson and S. F. Sherwood, who were to have presented a paper on The Occurrence of Melezitose in Honey-Dew Honeys, a report on the subject was made by E. T. Wherry. Supplementing the report of the referee on Coffee, F. B. Power gave a brief report on An Improved Method for the Quantitative Determination of Caffein in Vegetable Materials. This method, which has been published (E. S. R., 41, p. 412), was adopted by the association as a tentative method to be studied in connection with the present Official Methods.

Following the usual custom, a part of the second morning's session was devoted to addresses by the retiring president of the association, Dr. P. F. Trowbridge, and by the honorary president, Dr. H. W. Wiley. The former selected as his general subject The Meat Problem, and presented an urgent plea for the greater conservation of world foodstuffs in the fattening of animals for the market. The waste of food materials suitable for human consumption brought about by the common practice of hogging-down corn was convincingly pointed out in statistics obtained in experiments conducted by the author at the North Dakota Station. Incidentally a plea was made for the more extensive use of horse flesh in place of beef.

The reports of committees occupied practically all of the sessions of the third day. Dr. Alsberg, as chairman of the Board of Editors of the *Journal*, announced that arrangements had been made to continue its publication and that the next number would be issued in a short time. As the mailing list for the *Journal* is unavailable, a request was made that all past subscribers send their names and addresses to the editor to insure the receipt of the remaining numbers of the incomplete volume. Dr. Alsberg also announced that arrangements had been completed for printing the Official Methods, which will consist of a revision of Bulletin 107, including all changes and additions made through 1917, but not changes in methods adopted at the present meeting. These will, however, be published in the *Journal* as a supplement. The committee on form of recommendations by referees presented a blank form of report to be used by all referees.

The committee on the methods of sampling fertilizers to cooperate with a similar committee of the American Chemical Society offered the following recommendations, which were adopted: (1) That a sampler be used that removes a core from the bag from the top to the bottom; (2) that at least 1 lb. of material should constitute each official sample sent in to headquarters; (3) that the entire sample submitted to the chemist be passed through a 10-mesh sieve previous to the subdivision for analysis; and (4) that cores be taken from not less than 10 per cent of the bags present unless this necessitates cores from more than 20 bags, in which case a core shall be taken from one bag from each additional ton represented. If there are less than 100 bags not less than 10 bags shall be sampled, provided that in lots of less than 10 bags all shall be sampled.

An important change in the appointment of referees was recommended, with a view to eliminating unnecessary work on subjects so well developed as not to necessitate regular study. Under the new plan adopted, a general referee is appointed for certain related groups of subjects, with a sufficient staff of associate referees to work with him or under his direction in the investigation of certain important questions in the field covered by the work of the general referee. The general referee is expected to keep in touch with the literature dealing with the subjects embraced in his field, and to make recommendations for special inquiries at the annual meetings, or institute them in the interim if the situation is urgent.

The subjects in which a grouping has been made and the newly appointed referees are as follows: Fertilizers, R. N. Brackett; saccharine products, H. S. Paine; foods and feeding stuffs, G. L. Bidwell; canned foods, W. D. Bigelow; meats and meat products, R. Hoagland; dairy products, J. Hortvet; cacao products, W. C. Taber; and drugs, G. W. Hoover.

The following officers were elected for the coming year: H. C. Lythgoe, president; W. F. Hand, vice-president; C. L. Alsberg, secretary and treasurer; members of the executive committee, C. H. Jones and W. W. Skinner; and members of committee on recommendations of referees and revision of methods—subcommittee A, W. H. McIntire (1924), subcommittee B, E. M. Bailey (1924), and subcommittee C, W. W. Randall (1922) and W. D. Collins (1924). As chairmen of other committees, there were selected for the committee to cooperate with other committees on food definitions, W. Frear; editing methods of analysis, R. E. Doolittle; vegetation tests on the availability of phosphoric acid in basic slag, C. B. Williams; methods of sampling fertilizers, to cooperate with a similar committee of the American Chemical Society, C. H. Jones; and revision of methods of soil analysis, C. B. Lipman. The board of editors of the Journal consists of C. L. Alsberg (chairman), E. F. Ladd (1921), R. E. Doolittle (1923), C. B. Lipman (1922), and L. L. Van Slyke (1920).

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# RECENT WORK IN AGRICULTURAL SCIENCE.

## AGRICULTURAL CHEMISTRY—AGROTECHNY.

**First report on colloid chemistry and its industrial applications** (*Brit. Assoc. Adv. Sci., Rpt. Colloid Chem. [etc.], 1 (1917), p. 86*).—This report is the outcome of the work of a committee appointed by the chemical section of the British Association for the Advancement of Science, for the purpose of compiling information regarding the advances which have been made in colloid chemistry, with special reference to industrial processes. Two methods of classification have been adopted: First, a classification according to the nature of the property, principle, or phenomenon concerned, based on the recognized divisions of the science of colloid chemistry; and second, a classification in terms of the various technical processes themselves.

In the present report one subject only has been considered according to the first classification, namely: The Viscosity of Colloid Systems, by E. Hatschek. The subjects dealt with under the second classification, and contributors thereto are as follows: Colloid Chemistry of Tanning, by H. R. Proctor; General Review and Bibliography of Dyeing, by P. E. King; Colloid Chemistry in the Fermentation Industries, by A. J. Brown; Rubber, by H. P. Stevens; Colloid Chemistry of Starch, Gums, Hemicelluloses, Albumin, Casein, Gluten, and Gelatin, by H. B. Stocks; Colloids in the Setting and Hardening of Cement, by C. H. Desch; Nitrocellulose Explosives, and Celluloid from the Standpoint of Colloidal Chemistry, by E. R. Chrystall; and Colloidal and Capillary Phenomena in their Bearing on Physiology and Biochemistry, by W. Ramsden.

In a few of these reports bibliographies of the literature alone are given, and in all an attempt has been made to cover the literature to date (1917).

**Second report on colloid chemistry and its general and industrial applications**, F. G. DONNAN ET AL. (*Brit. Assoc. Adv. Sci., Rpt. Colloid Chem. [etc.], 2 (1918), pp. 172; also in Rpt. Brit. Assoc. Adv. Sci., 1918, Sect. B, pp. 172*).—This report follows the general lines of the report noted above. The subjects and authors are as follows: Report on Peptisation and Precipitation, by W. D. Bancroft; Emulsions, and The Liesegang Phenomenon, both by E. Hatschek; Electrical Endosmose, by T. R. Briggs; Colloid Chemistry in the Textile Industries, by W. Harrison; Report on the Part Played by Colloids in Agricultural Phenomena, by E. J. Russell; Sewage Purification with Reference to Colloid Chemistry, by E. Ardern; Colloid Problems in Dairy Chemistry, by W. Clayton; Colloid Chemistry in Physiology, by W. M. Bayliss; and The Administration of Colloids in Disease, by A. B. Searle.

**Crystallography**, E. T. WHERRY and E. YANOVSKY (*Jour. Wash. Acad. Sci., 9 (1919), No. 17, pp. 505–513, figs. 2*).—Crystallographic measurements of mor-

phine and some of its derivatives by the method previously noted (E. S. R., 39, p. 415) are reported from the Bureau of Chemistry, U. S. Department of Agriculture. The substances examined included morphine monohydrate, codeine, codeine monohydrate, codethyline monohydrate, and heroin.

**Nonprotein nitrogenous constituents of human milk**, W. DENIS, F. B. TALBOT, and A. S. MINOT (*Jour. Biol. Chem., 39 (1919), No. 1, pp. 47–51*).—A similar study to that previously noted (E. S. R., 41, p. 616) was made of human milk obtained from normal women whose infants were free from digestive disturbances.

Variations in the amount of the different extractives present in samples of milk drawn at different periods throughout the day were relatively small and of no apparent uniformity. The results of the examination of 71 samples of milk are summarized as follows:

*Nonprotein nitrogenous constituents of human milk.*

| Constituents. | Quantity per 100 cc. milk. | | Constituents. | Quantity per 100 cc. milk. | |
|---|---|---|---|---|---|
| | Minimum. | Maximum. | | Minimum. | Maximum. |
| | *Mg.* | *Mg.* | | *Mg.* | *Mg.* |
| Total nonprotein nitrogen | 20.0 | 37.0 | Preformed creatinin | 1.0 | 1.6 |
| Urea nitrogen | 8.3 | 16.0 | Creatin | 1.9 | 3.9 |
| Amino nitrogen | 3.0 | 8.9 | Uric acid | 1.7 | 4.4 |

Attention is called to the fact that the values found for nonprotein nitrogen, urea, preformed creatinin, and uric acid in milk are along the same general level as the values for the corresponding substances in blood. The amount of amino nitrogen is in some cases comparable with that in blood but in some cases lower, while the values for creatin are much lower than in blood

**The nitrogenous constituents of yeast**, J. MEISENHEIMER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 104 (1919), No. 5–6, pp. 229–283*).—An analysis of hydrolyzed yeast by Fischer's ester method is reported. Glycocoll, alanin, valin, leucin, prolin, phenylalanin, aspartic and glutaminic acids, tyrosin, and tryptophan were positively identified, and serin and cystin with less certainty. There was also some evidence of the presence of an aminobutyric acid.

**Analytical study of Spanish olive oil**, O. FERNÁNDEZ and F. BUSTAMANTE (*Bol. Inst. Nac. Hig. Alfonso XIII, 15 (1919), No. 58, pp. 85–92; also in Rev. R. Acad. Cien. Madrid, 17 (1919), No. 7–9, pp. 281–286*).—The analytical constants of 33 samples of Spanish oil are reported, the maximum, minimum, and average values of which are given in the following table:

*Analytical constants of Spanish olive oil.*

| Sample. | Density. | Index of refraction. | Iodin number. | Saponification number. | Acidity. | Specific temperature of reaction. |
|---|---|---|---|---|---|---|
| | | | | | *Per cent.* | *Degrees.* |
| Maximum | 0.9180 | 1.4694 | 89.5 | 221.0 | 3.2 | 97.9 |
| Minimum | .9128 | 1.4629 | 76.3 | 160.0 | .173 | 94.0 |
| Average | .9154 | 1.4661 | 83.9 | 196.9 | 1.34 | 95.9 |

These constants are compared with reported values for California and Italian olive oil.

**Oil of fenugreek**, H. E. WUNSCHENDORFF (*Jour. Pharm. et Chim., 7. ser., 19 (1919), No. 11, pp. 397, 398*).—The physical properties of the oil obtained from fenugreek seeds are described, and a table is given of its analytical constants. The oil is of a golden yellow color and disagreeable taste and odor. It belongs to the drying oils, solidifying very rapidly when exposed to the air. The analytical constants are as follows: Specific gravity at 15° C. 0.9471, index of refraction at 22° 1.4774, saponification number 189.5, iodin number 137.8, and acidity 3.2 per cent.

**The estimation of chlorate and perchlorate in saltpeter**, A. WOGRINZ and J. KUBER (*Chem. Ztg., 43 (1919), No. 5–6, pp. 21, 22; abs. in Chem. Abs., 13 (1919), No. 14, p. 1571*).—This is a critical discussion of various methods of determining chlorates and perchlorates in potassium and sodium nitrate.

**Comparative determination of humus by the Grandeau and Hilgard methods**, J. MENDES DE GODOY (*Escola Agr. "Luiz de Queroz," Piracicaba, Brazil, Ser. Chim. Agr. Bol. 2 (1919), pp. 12, fig. 1*).—Experiments with 13 different soils to compare the methods of Grandeau and Hilgard for determining humus content are reported.

In all cases a greater humus content was indicated by the Grandeau method than by the Hilgard method, and in most cases the Grandeau method indicated more humus in the subsoil than in the soil, while the opposite was the case with the Hilgard method. It is concluded that the Hilgard method is the better.

**Direct determination of nonamino nitrogen in the products of protein hydrolysis**, A. HILLER and D. D. VAN SLYKE (*Jour. Biol. Chem., 39 (1919), No. 3, pp. 479–488*).—A modification of the Van Slyke method of analyzing proteins (E. S. R., 34, p. 505) is described, in which the nonamino nitrogen instead of being determined indirectly is determined directly in the nonamino acid fraction of the products of protein hydrolysis.

The procedure is exactly the same as that used in the former method for protein analysis until the hexone bases have been separated from the remaining amino acids. After the removal of the phosphotungstic acid from the filtrate with amyl alcohol and ether, the primary amino nitrogen is removed by warming with sodium nitrite and hydrochloric acid, the excess nitrous acid removed by reduction to ammonia with a zinc-copper couple by Scales' method (E. S. R., 36, p. 504), and the residual nonamino nitrogen determined by the ordinary Kjeldahl method.

The results of this method in analyses of casein and gelatin are said to agree closely with the results obtained indirectly. This indicates that "the original method, although indirect, contains no inherent errors, and that when due precautions in regard to calibrated apparatus and standardized solutions are observed, results of practically the same degree of accuracy can be obtained by the original, somewhat simpler indirect method, as by the present direct one."

**Determination of gluten**, MARCHADIER and GOUJON (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 8, pp. 243–246; also in Jour. Pharm. et Chim., 7. ser., 19 (1919), No. 12, pp. 425–434*).—A method for the determination of gluten in flour is described, which consists essentially in centrifuging 1 gm. of flour with 10 cc. of pure acetic acid for about five minutes at 1,500 revolutions per minute, pouring off the supernatant liquid, and repeating the process twice. The combined solutions of gluten in acetic acid are evaporated on a water bath to dryness and heated in an oven at 100° C. for an hour, the resulting residue representing the dry gluten.

**Determination of citric acid in mixtures and compounds**, T. C. N. BROEKSMIT (*Pharm. Weekbl., 56 (1919), No. 31, pp. 1047–1052*).—The method consists

essentially in oxidizing the citric acid in acetic acid solution with potassium permanganate, and treating the acetone thus formed with ammonia and an alcoholic solution of iodin to form iodoform. The technique for the procedure with fruit juices, milk, and various salts of citric acid is described. In the cases of fruit juices and milk a preliminary treatment is necessary, which consists in adding alcohol, filtering, and adding barium acetate to the filtrate to form barium citrate. This is then treated with acetic acid, potassium permanganate, etc., as noted above.

**Volumetric method for the determination of salicylic acid in the presence of salicylic aldehyde**, R. BERG (*Chem. Ztg., 43 (1919), No. 32–33, p. 129*).—The method described depends upon the fact that colorless solutions of salicylic aldehyde develop a strong citron yellow color on the addition of traces of alkali, and that this color disappears on the addition of a weak acid such as carbonic acid.

The ether solution of the substance to be tested is shaken 3 times with N/20 sodium carbonate solution and then washed 3 or 4 times with water. If the last wash water on the addition of a drop of N/20 sodium hydroxid remains colorless, sodium carbonate must be added again. When the reaction is complete, the combined extract is titrated with N/20 sulphuric acid until colorless, warmed to allow escape of carbon dioxid, and titrated with N/20 sodium hydroxid until the yellow color is again produced. The amount of salicylic acid $a$ is calculated from the formula $a=(t-[t_1-t_2)]\times 0.0669$, $t$ being the number of cubic centimeters of sodium bicarbonate, $t_1$ of sulphuric acid, and $t_2$ of sodium hydroxid employed.

**The electrical conductivity of milk**, J. H. COSTE and E. T. SHELBOURN (*Analyst, 44 (1919), No. 518, pp. 158–164, figs. 2*).—An investigation of the effect of certain factors upon the electrical conductivity of milk is reported and summarized as follows:

The temperature coefficient of electrical conductivity in the region of 15° C. is 0.000093, or about 2.3 per cent of the total conductivity. The electrical conductivity of presumably genuine milks may vary from $K_{15}=0.0035$ to 0.0047, but in more than 50 per cent of the 200 or more samples examined it was between 0.004 and 0.0042. The electrical conductivity of milk increases up to a certain point with the development of acidity, but reaches an almost constant value while the amount of acid is still increasing. There is no well defined correlation between electrical conductivity and total solids or total ash, but a marked correlation between the electrical conductivity and the chlorin content of milk. The specific conductivity of a mixture of milk and water decreases with dilution, but that of the milk in the solution increases greatly as the dilution increases ,owing probably to dissociation of phosphates and citrates.

In explaining these conclusions the authors refer to the work of Jackson and Rothera (E. S. R., 33, p. 203), in which the results of measurements of the electrical conductivity, percentage of milk sugar, and depression of the freezing point of milk are interpreted from a physiological viewpoint.

The authors conclude that the value of the electrical conductivity of milk is not sufficiently well defined to make the determination generally useful for detecting adulteration. "It would, however, be useful in a large dairy or institution as a check on watering of milk which had already been examined by the conductivity method, and which had afterwards passed through various hands."

**Table for sorting of milk samples**, L. J. HARRIS (*Analyst, 43 (1918), No. 512, pp. 375–377, fig. 1*).—A table, calculated from Richmond's formula $T=0.25G-1.2F+0.14$, is given which is said to enable the analyst to determine at a glance, knowing the specific gravity and total solids of the sample, whether it is above

or below the minimum standard of the British Board of Agriculture, and in the latter case whether the deficiency is in fat, or solids-not-fat, or both.

A phase-diagram is also given, which summarizes the conditions under which milk samples will be above or below the standard.

**Methods of calculating added water in milk**, L. J. HARRIS (*Analyst, 44 (1919), No. 515, pp. 43–45*).—The author suggests possible methods to obviate the long computations involved in the use of the formula proposed in an earlier paper (E. S. R., 40, p. 412) for calculating added water in milk. The first method suggested consists of a shorter calculation of the solids-not-fat in the fat-free milk and the determination of the extraneous water by reference to a table which has been worked out by the author. Suggestions are also given for the use of an alignment chart, or a slide rule.

**Milk calculations: A criticism**, H. D. RICHMOND (*Analyst, 44 (1919), No. 519, pp. 200, 201*).—The author criticizes the two papers of Harris noted above and two earlier ones previously noted (E. S. R., 39, p. 612; 40, p. 412), on the ground that the assumptions on which they are based are not wholly true.

**Calculation of the composition of the original milk from the analysis of cheese**, H. D. RICHMOND (*Analyst, 44 (1919), No. 519, p. 202*).—To calculate the fat and solids-not-fat in the original milk from the analysis of the cheese made from it, the author proposes the formula given below (F=percentage of fat in cheese and P=percentage of proteins in cheese):

$$\text{Fat in original milk} = \frac{100F}{35.4P+F} + 0.25.$$

$$\text{Solids-not-fat in original milk} = \frac{333P}{35.4P+F}.$$

**The temperature of solution of butter fat in various reagents**, J. H. JOHNSTON (*Jour. Dairy Sci., 2 (1919), No. 2, pp. 130–132*).—The author refers to the discussion by Fryer and Weston (E. S. R., 39, p. 110) regarding the Valenta test, and suggests the use of absolute alcohol in place of the mixture of ethyl and amyl alcohols recommended in the article noted. The result, or Crismer number, is said to vary from 51 to 56° C. for butter fat, the number in most cases being 53 to 54°. For margarin made chiefly from beef fat the number is over 65°, and from vegetable fats below 45°. With old butters, the acidity calculated as oleic acid after titration with N/10 alkali should be multiplied by the factor 1.5 and the result added to the observed temperature to give the corrected Crismer number.

**Hydrogenation of peanut oil**, F. HEIM, A. JOB, and H. STURZWAGE (*Bul. Off. Colon. [France], 11 (1918), No. 127–128, pp. 355–361, figs. 2; abs. in Internatl. Inst. Agr. [Rome], Internatl. Rev. Sci. and Pract. Agr., 10 (1919), No. 1, pp. 108, 109*).—The authors describe an apparatus for the hydrogenation of oils on a small scale with the use as a catalyzer of hydrated nickel formate, $(HCOO)_2$ Ni, 1.5 $H_2O$, and describe the hydrogenation of arachis (peanut) oil with the apparatus. The hydrogenated oil obtained was a hard wax-like solid with the following analytical constants: Iodin number 13.5, temperature of solidification 47.8° C., and melting point 58°. The possibility is suggested of altering these constants by varying the time and temperature of the reaction so as to obtain a fat of the same hardness as different animal fats.

**Kaolin for tannin analyses**, R. W. FREY (*Jour. Amer. Leather Chem. Assoc., 14 (1919), No. 7, pp. 393–401*).—The author, from the Bureau of Chemistry, U. S. Department of Agriculture, has collected data from various contributions on kaolin for tannin analysis, on the basis of which a tentative scheme of kaolin specifications is proposed.

**Conference on the production and consumption of sugar within the British Empire** (*Jour. Soc. Chem. Indus., 38 (1919), No. 15, pp. 287T–314T, figs. 2*).—This account of the conference on the production and consumption of sugar within the British Empire, held in London on July 16, 1919, contains the preliminary report of the Empire Sugar Supply (Technical) Committee with discussions of the same. The report consists of statistics on the prewar sugar position of the British Empire as regards production, consumption, and the quantity, nature, and source of the sugar imported or exported by each unit of the Empire; the economic sugar-producing possibilities of each unit, the most likely localities for increased supply, and the kind of sugar required by the various consumers throughout the Empire; and technical suggestions for the development of the industry.

**The paper making qualities of Hawaiian bagasse,** ARTHUR D. LITTLE, INC. (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul. 46 (1919), pp. 51*).—This detailed report consists of the following sections: General survey of the question of the utilization of Hawaiian bagasse for paper making, discussion of the various previous attempts to utilize bagasse as a paper making material, description of the principal paper making processes, discussion of the technique involved in handling Hawaiian bagasse for paper making with special reference to the experimental results obtained, commercial aspect of the paper making possibilities of Hawaiian bagasse, estimates of investment and production costs, and tabulation of experimental data.

Hawaiian bagasse fiber was found to have practically the same characteristics as the fiber from Cuban bagasse. The fiber is somewhat shorter than so-called soda pulp, the shortest bleached fiber in large-scale use in the United States, and is thought to have certain points of superiority over it. Used alone, it is suitable for book paper and certain grades of writing paper, but it is thought that the widest application of bagasse pulp would be in admixture with rag, sulphite, or soda fibers for the production of such papers. For wrappings and other papers in which strength is the principal consideration bagasse pulp is considered of little value. Failures of previous attempts to develop bagasse as a paper making material are attributed, chiefly, to a lack of comprehension of the characteristics of bagasse, and to attempts to convert it into a grade of paper to which it was ill adapted.

From experimental results obtained in the application of various processes to different samples of Hawaiian bagasse, it was found that for the large-scale separation of pith the bagasse should be given a somewhat finer shredding than is necessary in the sugar mill, that the sulphate process with the spherical-rotary type of digestion is best adapted for cooking the bagasse, and that the pulp can be easily bleached with 15 per cent of bleaching powder. The relative yields of bleached pulp from different varieties of Hawaiian bagasse in percentage of air-dry bagasse are estimated as 30 per cent for the Yellow Caledonia variety, 26.7 per cent for Hawaii 109, and 22.3 per cent for Lahaina bagasse. No marked difference in quality of the pulp from the different sources was noted.

Estimates of investment and production costs on the basis of prewar conditions as existing in 1912 indicate that a bagasse pulp and paper mill with a daily capacity of 30 tons of paper would yield a net profit of 25.3 per cent after deducting interest at 6 per cent on the total capital involved, and that under the same conditions a mill with a 10-ton output might be expected to yield a return of 15.6 per cent.

**Unfermented grape juice: How to make it in the home.** C. DEARING (*U. S. Dept. Agr., Farmers' Bul. 1075 (1919), pp. 32, figs. 20*).—This bulletin gives directions for the home preparation of unfermented grape juice. Descriptions are

given of the three types of these juices corresponding to the types of grapes grown in the principal grape-growing districts of the United States, and of the two general methods employed in preparing the juice.

The types of juices are (1) the northeastern type, prepared especially from the northeastern fox grape, *Vitis labrusca*, which is characterized by its relatively high content of acid in proportion to sugar; (2) the western type, prepared from the European grapes, *V. vinifera*, of the Pacific coast grape sections, which have a high sugar content; and (3) the southeastern type, prepared from Muscadine grapes (*V. rotundifolia* and *V. munsoniana*) of the Southeastern States, which are somewhat lower in sugar content and higher in acidity than the western grapes but resemble them in the transparency and brilliancy of their juices.

The cold-press method of extracting juice is considered preferable for use with the western and southeastern types and the hot-press method for the eastern type. The main steps of the process in both methods, from the selection of the grapes to the storage of the final product, are outlined and discussed, and diagrams with accompanying descriptions are given of homemade grape crushers and presses of different types.

**Culture of cabbage for sauerkraut.** L. Lebrun (*Culture du Chou a Choucroute. Paris: Libr. Agr. Maison Rustique, 1918, pp. 32, figs. 2*).—This pamphlet contains directions for the culture of cabbage to be used for sauerkraut, for the manufacture of sauerkraut on a small and a commercial scale, and for its preparation for the table.

**Low temperature-vacuum food dehydration.** K. G. Falk, E. M. Frankel, and R. H. McKee (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1036–1049, fig. 1*).—In this article a description is given of the low temperature-vacuum dehydration process originally developed for the dehydration of meat, but later employed successfully for the dehydration of vegetables and fruits as well as meat and fish. The process consists briefly in heating the meat (or other food products), cut in pieces of suitable size, to a temperature below that at which cooking or appreciable changes take place, continuously maintaining a degree of vacuum such that the vapor pressure of water at the temperature employed is greater than the pressure within the vacuum drier, thus causing boiling and evaporation of the water from all parts of the meat, and introducing a sufficient quantity of heat to evaporate the large amount of water liberated.

In the commercial vacuum shelf drier used, hot water or low-pressure steam circulates through the shelves upon which are placed galvanized iron wire-gauze trays containing the substance to be dried. In the dehydration of meat the vacuum maintained corresponds to a pressure of 2 in. of mercury, and the temperature of the circulating fluid is kept at about 70° C. The time of dehydration varies with the size of the individual pieces of meat used. With steaks 0.25 in. thick dehydration requires from 2 to 3 hours. The final product weighs about 28 per cent of its original weight, contains approximately 10 per cent of water, and occupies about one-half the original volume. If kept under ordinary atmospheric conditions, no perceptible chemical change has been found to occur at the end of a year.

Fish, shell fish, fruits, and vegetables have been dried by this process without difficulty and with very satisfactory results. In general, the process has been found to cause less destruction of enzyms and less loss of volatile products than with air-blast dehydration.

The work of the Harriman Research Laboratory, Roosevelt Hospital, New York City, in affiliation with the Division of Food and Nutrition, Medical

Department, U. S. Army, K. G. Falk (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1062, 1063*).—A brief statement is given of the lines of investigation which have been carried on at the Harriman Research Laboratory in a study of the protein decomposition of meat. These have included the chemical study of meat spoilage, the published results of which have been noted from various sources (E. S. R., 40, pp. 712, 713); a study, by I. Greenwald, of the factors upon which the toxic action of spoiled meat depend (E. S. R., 41, p. 668); and a study of the methods for preventing spoilage which resulted in the new process of dehydration noted above.

## METEOROLOGY.

**Smithsonian meteorological tables** (*Smithsn. Misc. Collect., 69 (1918), No. 1, pp. LXXII+261, fig. 1*).—This is the fourth revised edition of these tables, the original edition of which was issued in 1893. The revision was "prepared under the direction of Prof. Charles F. Marvin, Chief of the U. S. Weather Bureau, assisted by Prof. Herbert H. Kimball. . . .

"All errata thus far detected in the earlier editions have here been corrected. New vapor pressure tables, derived from the latest experimental values by means of a modification of Van der Waals' interpolation formula devised by Professor Marvin, have been introduced. The table of relative acceleration of gravity at different latitudes has been recomputed from a new equation based upon the latest investigations of the U. S. Coast and Geodetic Survey. These values have been employed in reducing barometric readings to the standard value of gravity adopted by the International Bureau of Weights and Measures, supplementing a table that has been introduced for directly reducing barometer readings from the value of gravity at the place of observation to its standard value. The new values of vapor pressure and of gravity acceleration thus obtained, together with a recent and more accurate determination of the density of mercury, have called for an extensive revision of numerous other tables, and especially of those for the reduction of psychrometric observations, and the barometrical tables. Among the new tables added are those for converting barometric inches and barometric millimeters into millibars, for determining heights from pressures expressed in dynamic units, tables of gradient winds, and tables giving the duration of astronomical and civil twilight, and the transmission percentages of radiation through moist air. The tables of international meteorological symbols, of cloud classification, of the Beaufort scale of winds, of the Beaufort weather notation, and the list of metorological stations, are among those extensively revised. Tables for reducing barometric readings to sea level, and tables of logarithms of numbers, of natural sines and cosines, of tangents and cotangents, and for dividing by 28, 29, and 31, with a few others, have been omitted from this edition."

The volume includes thermometrical tables, conversions involving linear measures, conversion of measures of time and angle, conversion of measures of weight, wind tables, reduction of temperature to sea level, barometrical tables, hygrometrical tables, geodetical tables, and miscellaneous tables.

**Climatological data for the United States by sections** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 6 (1919), Nos. 5, pp. [203], pls. 4, figs. 2; 6, pp. [201], pls. 4, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1919, respectively.

**Meteorological observations at the Massachusetts Agricultural Experiment Station**, J. E. Ostrander and G. A. Smith (*Massachusetts Sta. Met. Buls. 369–370 (1919), pp. 4 each*).—Summaries of observations at Amherst, Mass., on

pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1919, are presented. The data are briefly discussed in general notes on the weather of each month.

**Climatic factors [at the Hettinger substation, N. Dak.]**, A. J. Ogaard (*North Dakota Sta. Bul. 130 (1919), pp. 31–35, figs. 5*).—Rainfall data for Hettinger from 1910 to 1917, inclusive, and for New England, about 40 miles northwest, and Orange, 30 miles southeast of Hettinger, from 1894 to 1909, inclusive, are summarized in tables and diagrams. Data are also given for evaporation, temperature, frost-free period, and wind velocity at Hettinger, 1911–1917.

The average annual rainfall for the region was 14.03 in., the average for Hettinger being 14.37 in. The average seasonal rainfall was 10.84 in. The average seasonal evaporation (April to September) was 32.78 in. The average frost-free period at Hettinger was 112 days, varying from 91 days in 1911 to 128 days in 1912. May 15 is considered a comparatively safe date for planting corn, in most years. The data recorded do not indicate any progressive climatic changes in the region.

**The weather of the past agricultural year**, F. J. Brodie (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 174–184*).—The weather conditions, particularly rainfall, temperature, and sunshine in Great Britain during the winter of 1917–18 and the year 1918 are briefly summarized as in previous reports.

**Swedish meteorological observations** (*Met. Iakttag. Sverige (Observ. Mét. Suéd.), Met. Centralanst., 57 (1915), pp. XIII+181; 58 (1916), pp. XIV+181*).—These are the detailed tabular reports of the Central Meteorological Institute of Sweden for 1915 and 1916.

**Warm season droughts** (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 19 (1919), pp. 2, 3, figs. 2*).—Two charts are given which show the percentage of years with 30 consecutive days or more without 0.25 in. of rainfall in 24 hours from March to September, inclusive, and the longest period in 20 years when similar conditions prevailed.

Drought periods of the character indicated "occur with less frequency in the interior of the Northeast, in the area extending northward from the central Appalachian Mountain districts through Ohio, and in the Southeast. In these sections there is experienced, on the average, only about one year in three having a period of one month's duration without 0.25 in. of rainfall in 24 hours. The percentages increase, as a rule, to the westward, and in the more western portions of the Great Plains phenomena of this character are practically of yearly occurrence. In the Ohio, central Mississippi, and lower Missouri Valleys the percentages range from 40 to 50, but are somewhat higher to the southward, while they show a rapid increase from the eastern portions of the Plains States toward the western portions." The number of consecutive days without 0.25 in. of rainfall from March 1 to September 30 during a period of 20 years ranges from a maximum of about 80 in the western Great Plains to a minimum of about 40 from the central Appalachian Mountains northward to Lake Erie.

**Average summer rainfall** (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 20 (1919), pp. 2, 3, figs. 2*).—Charts are given which show for the various sections of the country the average amount of rainfall for the three summer months, June to August, inclusive, and the percentage of the annual precipitation that occurs during the summer months. A wide difference in summer rainfall in different parts of the country is shown, the minimum being in the southern Pacific coast districts and the maximum along the west coast of the Florida Peninsula.

"In the Pacific Coast States the summer is almost rainless, except in the more northern section, where showers may be expected to occur occasionally, especially in the mountains. . . . In the Plains States it is comparatively heavy, and in New Mexico and eastern Arizona much of the annual precipitation occurs during the summer months, mostly in July and August. In the central and east Gulf and south Atlantic coast districts rainfall is usually heavy during this season, the totals ranging from 16 to 25 in., and it is comparatively heavy also in portions of the Appalachian Mountain region, where locally as much as 20 in. is received on the average. . . .

"In the central and northern Plains States from 45 to 50 per cent of the annual amount occurs during this season, as a rule; the agricultural importance of that area is largely due to this fact. Large percentages of the annual amount occur during the summer months also from western Texas to central Arizona. Along the southern Pacific coast, however, less than 1 per cent of the annual rainfall occurs during the three summer months. In most of the country east of the Great Plains the percentages range from 25 to 30. In this area the seasonal distribution of precipitation is comparatively uniform, except in the Florida Peninsula, with no distinctive types of special agricultural significance, although the comparatively light falls in the cotton belt during much of the cotton picking season are favorable for the prosecution of that work."

**Weather and corn, 1919** (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 27 (1919), p. 2, figs. 6*).—Diagrams are given which indicate the variations of temperature and rainfall from the normal, by weeks, during the season of 1919 in the principal corn-growing States, and also show the condition of corn on the first of July, August, and September, respectively, expressed in percentages of the 10-year average. The relations of weather and crop conditions are briefly discussed.

**Weather and winter wheat, 1918–19** (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 27 (1919), p. 2, figs. 9*).—Diagrams are given which show for the more important winter-wheat States the total precipitation and departure of the mean temperature from the normal, by months from August 1918, to May, 1919, inclusive, and also the condition of winter wheat on the first of December, 1918, and April, May, and June, 1919, expressed in percentages of a 10-year average. The correlation of the weather conditions and the growth and yield of crop are briefly discussed.

**Everyday mistakes about the weather,** C. F. Talman (*Ladies' Home Jour., 36 (1919), No. 9, pp. 49, 168*).—This article deals with popular fallacies regarding the moon's influence on the weather, long-period forecasts, very cold winters of former times, change of climate, effect of the Gulf Stream, battles and rain, equinoctial storms, Indian summer, cyclones, and violent storms.

## SOILS—FERTILIZERS.

**Soil samples, maps, and profiles,** A. van Bijlert (*Meded. Landbouwhoogsch. [Wageningen], 16 (1919), No. 1–2, pp. 29–36, pls. 4*).—Information is given on the taking and preparation of soil samples and soil profiles, and the preparation of soil maps for display and instruction purposes.

**Soil survey of Mercer County, Pa.,** E. B. Deeter, R. A. Winston, and W. I. Galt (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 40, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the Pennsylvania Experiment Station, deals with the soils of an area of 448,000 acres in northwestern Pennsylvania, the surface of which ranges from level to hilly.

The soils of the county consist principally of glacial till derived from the Late Wisconsin glaciation. "Where the soils have developed under conditions of good drainage they are brown in the surface horizon, while the subsoils are yellowish to brownish yellow. From this condition there are various gradations down to the extremely wet and impervious soils, where the surface soils and subsoil are light gray in color." Fifteen soil types of 10 series and 2 miscellaneous types are mapped, of which the Volusia and Canfield silt loams cover 39.3 and 28.7 per cent of the area, respectively. The soils of the county are said to be generally in need of lime.

**Soil analysis**, L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 135–140*).—Analyses of several samples of upland soils of Nova Scotia, representative of about 400 samples analyzed, showed that the organic matter and nitrogen contents of virgin soils were very low, while in pasture and cultivated soils there were sufficient quantities of nutritive materials. In old so-called "run out" soils, a considerable nitrogen accumulation was found. Physical analyses showed that the upland soils are usually sandy soils.

**Black soils**, L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 145–147*).—Analyses of 13 samples of the so-called black soils of Nova Scotia are reported, indicating a high organic matter content and low mineral matter content. These soils are usually from low spots, but it is the opinion that a well-decayed black soil, when composted with manure, provides nitrogen and humus in good quantity and retains moisture and liquid manure. Such soils are usually quite acid and need liming.

**Further studies on the soils of North Wales**, G. W. ROBINSON and C. F. HILL (*Jour. Agr. Sci. [England], 9 (1919), No. 3, pp. 259–282, figs. 2*).—This is a second paper on the subject (E. S. R., 38, p. 116), in which studies on the general characteristics of the carboniferous soils and the soils derived from the northern drift, together with associated deposits, are reported.

The soils studied are generally lowland soils. Mechanical and chemical analyses are reported showing that the coarsest fractions of these soils consist almost entirely of quartz sand. They are all generally deficient in lime, but contain reasonable quantities of potash.

**Biological analysis of soils**, A. R. PADMANABHA AIYER (*Dept. Agr. Cent. Provs. and Berar [India], Rpt. Agr. Col., Nagpur, Bot. and Chem. Research [etc.], 1918, pp. 17–19*).—Studies of embanked wheat soils to determine whether the gradual deterioration of wheat yields was due to lack of any of the normal biological activities are reported. Samples were taken from three plats. Plat I was kept open and plowed at the beginning of the rains and harrowed at intervals between rains. Plat VI was flooded until one month before planting, when it was drained and harrowed. Plat VII was flooded and not cultivated before planting.

Moisture determinations showed that soils from Plat VII contained 32 per cent, from Plat VI 31 per cent, and from Plat I 26 per cent of moisture, as against 44, 40, and 35 per cent, respectively, for the previous year. There was no noticeable difference in the nitrogen-fixing powers of the soils for the two years. Carbon dioxid production was the same in soils from Plats I and VI but was greater in Plat VII than in the others. "The number of bacteria in Plat I . . . was, however, much lower than Plat VI, but was still higher than Plat VII. The results of nitrification in the case of Plat I were contrary to those obtained last year. The percentages of nitrogen transformed in the form of nitrate from the same amount of organic manure . . . after eight weeks' incubation were as follows: Plat I, 21,3 per cent; Plat VI, 53.4 per cent; and Plat VII, 46.9 per cent."

Biological studies of bhatta soils containing about 69 per cent of stones and gravel show that this soil is quite efficient in the production of carbon dioxid and also in ammonification. The rate of nitrogen fixation is, however, about half of what takes place in black cotton soil. "Nitrification, though not as good as the black cotton soil, can still safely be classed as average. . . . It was found that the growth of plants in bhatta soil was very much inferior to those from black cotton soil; and that the former had a very poor development of root nodules. This effect was not, however, so much noticed in the case of groundnut crop. Subsequent pot culture experiments on sann hemp alone have conclusively shown that inoculation of the bhatta soil with black cotton soil shows much improvement in the growth of the plants, and that inoculation combined with a dressing of til cake . . . at sowing time gives most promising results."

**Cultures of bacteria on sterilized soil,** C. BARTHEL (*Meddel. K. Vetensk. Akad. Nobelinst., 5 (1919), No. 20, pp. 13, pl. 1*).—Studies are reported on the growth of pure cultures of different organisms introduced into garden soil rich in organic matter and containing some sand which was previously sterilized in the autoclave. The organisms tested were *Azotobacter chroococcum, Bacterium radicicola, Streptococcus lactis, Bacterium casei, and Bacillus mycoïdes.*

It was found that in most cases these organisms, when introduced in pure culture into the sterilized soil, grew and developed much more easily and better than in crude unsterilized soil. These results are considered to be of some significance from the soil fertility standpoint.

**Nitrification in Egyptian soils,** J. A. PRESCOTT (*Jour. Agr. Sci. [England], 9 (1919), No. 3, pp. 216–236*).—Two years' study on the biological conditions of the soil of an Egyptian farm, with special reference to nitrification, are reported. The soil was typical of the Nile alluvium.

It was found that in all cases the moisture content of the soil limited biological processes more than any other factor. "There was observed throughout the season in a cotton field a relatively large amount of nitrate, more than sufficient for the immediate needs of the cotton plant. The lack of response on the part of the Egyptian cotton crop to nitrogenous fertilizers may be accounted for in part, if not entirely, by the fact that nitrification in the soil is well ahead of the needs of the crop." There was no accumulation of nitrate in soil under wheat and maize.

It is thought that the period of winter fallow, during which the soil depends for its water only on the rainfall, may be a period of steady nitrification when the amount of rainfall is sufficiently high. The summer fallow soils immediately after removal of the winter crops were found to be biologically dormant. They were characterized by very low moisture content and by fairly high temperatures.

Pot experiments with wheat and maize showed that the root activities of a growing crop have some limiting effect on the production of nitrate in the soil. In both cases the fallow pots accumulated appreciably more nitrate than the cropped pots.

**The relationship between contraction and the percentage of colloidal clay** (*West Indian Bul., 17 (1918), No. 2, pp. 113–118, fig. 1*).—Studies on the amounts of internal pore space existing in blocks of 16 different soils which have been allowed to contract to the full extent and from which any residual water has been removed by subsequent drying to a constant weight at 110° C. are reported.

Comparison of these amounts with the observed value for linear shrinkage showed that a linear relationship appears to exist between the two values.

"By extrapolating the curve thus obtained, an approximation for the limiting value of the shrinkage in the case of pure colloidal clay is arrived at amounting to approximately 23 per cent. On this assumption it becomes possible to calculate the approximate content of colloidal material in any soil from a knowledge of the linear shrinkage. Results are adduced showing the values obtained for the shrinkage in the case of separated fine silt and clay fractions in the case of two soils of known shrinkage and physical composition, and compared with the values calculated from previous assumptions."

**The influence of stones in soil on the growth of plants**, T. Pfeiffer, W. Simmermacher, and H. Friske (*Landw. Vers. Sta., 93 (1919), No. 1–2, pp. 49–63, fig. 1*).—Pot culture experiments with oats on a productive loam soil mixed with stones so that the pots contained 25, 50, 75, and 100 per cent of loam are reported.

It is concluded that a very high stone content in soil does not cause any considerable loss of energy through the root development of oats and similar crops. It was found that there was practically no difference in the available water and plant nutrients in the different soils, and the yield of dry matter varied only within the limits of error. It is further concluded that soil volume as such has no direct influence on plant growth.

**Soils and manures** (*Bd. Agr. and Fisheries [London], Guides Small Hold., No. 6 (1919), pp. 30*).—This pamphlet gives brief popular information on the subject for the benefit of service men intending to settle on the land.

**Some experiments on sand hill land: Tillage, fertilizer, and crop adaptation**, A. G. Smith and O. O. Camp (*S. C. Dept. Agr., Com. and Indus., Bul. 63 (1918), pp. 20, fig. 1*).—General soil development experiments are reported, the purpose of which was to determine the proper treatment and crops for coarse sandy soil, usually with yellow sandy subsoil.

It was found that deep breaking of sandy lands was generally more profitable than shallow breaking, although in some years shallow breaking gave the better results. Barnyard manure was more profitable when applied to cotton than to other crops. Manure drilled gave higher yields of cotton than manure broadcasted. In a comparison of acid phosphate, basic slag, and rock phosphate, with barnyard manure, acid phosphate and rock phosphate on the average gave practically the same results, while without manure, acid phosphate was the best. Rock phosphate did not compare so favorably with acid phosphate and basic slag the first year as it did the second and third years. Shallow cultivation gave higher yields of cotton than deep cultivation.

**The influence of kind of soil and fertilization on nitrogen and ash content of crops**, J. G. Maschhaupt (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta. [Netherlands], No. 23 (1919), pp. 40–56*).—Continuing previous experiments (E. S. R., 41, p. 422) with the same soils, crops, and fertilizer treatments, the same general results were found regarding the composition of crops. On swamp soil, the potato tubers had a high nitrogen content and a very low phosphoric-acid content. It is concluded that phosphoric-acid fertilizers are not particularly available to crops on drained swamp soil, although the availability was somewhat increased by addition of ammonium sulphate. Marked differences were observed in the composition of crop tops in these experiments from those in previous experiments, especially with reference to potash content.

It is generally concluded that the influence of fertilization on the composition of the ashes of plants can be judged with safety only when the harvested crops vary very little with reference to yield and growth status.

**Manures in their relation to soils and crop production in the Central Provinces**, D. Clouston (*Agr. Jour. India, 14 (1919), No. 1, pp. 101–106*).—This is

a summary of fertilizer experiments on alluvial wheat soils, black cotton soils, and lateritic rice soils.

It has been found on the rice soils that 10 lbs. of nitrogen per acre added as poudrette has given a greater increased return than the same amount of nitrogen added as cattle manure, and a still greater increase has been obtained from night soil. Additions of calcium cyanamid and of bone meal separately, and of bone meal in combination with sodium nitrate, have resulted in a loss. Bone meal combined with ammonium sulphate has generally given a small profit, as have also dried leaves and tank silt. Castor cake has given a small net profit in some cases and a loss in others.

"The only manures which have consistently given large acreage profits are cattle manure, night soil, and poudrette. The supply of night soil and poudrette is so small and the difficulty of getting sweepers to apply them so great that they are only of secondary importance as an economic factor in crop production. It therefore becomes evident that of the manures available in any quantity, cattle dung is the only one which really counts." Green manure is suggested as the best probable substitute for cattle manure, and experiments with sann-hemp as green manure on rice soils have proved profitable.

Experiments on cotton soils with urine earth "have shown that, in the year of application to jowar (*A. sorghum*) and cotton fields, the urine of a bullock for any definite period of time is equal in manurial value to its solid excreta for the same time." Green manuring is not considered a feasible proposition on this soil.

**Soil deficiencies in India, with special reference to indigo.—Phosphorus and the future,** H. E. Armstrong (*Jour. Roy. Soc. Arts, 67 (1919), No. 3471, pp. 446–460; abs. in Chem. Abs., 13 (1919), No. 16, p. 1892*).—This is a general discussion on deficiency of phosphates in Indian soils with special reference to indigo soils.

In the soils examined phosphate was found to be deficient, while potash, calcium, nitrogen, and organic matter were present in relatively great excess. Additions of superphosphate and green hemp produced the best yields of indigo. It is pointed out that indican formation depends on a good available supply of phosphate, while an excess of nitrogen in the soil retards indican formation.

**Fertilizers,** J. G. McDonald (*Rhodesia Munitions and Resources Com. Rpt. 1918, pp. 35–41*).—This is a short note on the value and proper use of fertilizer, with special reference to Rhodesian conditions.

**Peat and its utilization,** P. de Mongolfier (*La Tourbe et Son Utilisation. Paris: H. Dunod et E. Pinat, 1918, pp. [II]+179, figs. 23*).—This book deals with the origin and physical and chemical properties of peat, describes the peat deposits of Europe and America, and discusses its commercial exploitation as fuel, source of gas, fertilizer carrier, etc., and its general agricultural value.

**Experiments with night soil as manure,** P. C. Patil (*Agr. Jour. India, 13 (1918), No. 2, pp. 281–286, pl. 1*).—Experiments with night soil as a manure on sorghum, cotton, and rice show it to be profitable and in comparison with barnyard manure to have a considerably greater residual effect. "To ensure success the following conditions are required: (1) Before application of the manure the soil should be well harrowed, at least to a depth of 3 in., so that the soil to that depth is loose and soft; (2) the rainfall should be heavy in the first two months of the rainy season; and (3) the night soil should be applied in the dry season so that it will get dry in the soil as soon after application as possible, allowing thorough mixing with the soil and preventing the breeding of flies."

**The pressing of sewage sludge,** K. Allen (*Trans. Amer. Soc. Munic. Impr., 24 (1917–18), No. 1, pp. 1–25, figs. 7*).—This paper presents the main features

of the practice of sewage sludge pressing to obtain fertilizer material, fuel, etc. Dewatering sewage sludge by filter pressing with the plate type of press has been brought to a point where its efficiency and cost can be closely predicted. With fresh settled or precipitated sludge, the addition of from 0.5 to 3 per cent of lime, and a pressure of 70 or 80 lbs. per square inch, a firm, satisfactory cake can be produced.

**Commercial oxidation of ammonia to nitric acid**, C. L. Parsons (*Jour. Indus. and Engin. Chem., 11 (1919), No. 6, pp. 541–552, figs. 13; abs. in Chem. and Metall. Engin., 20 (1919), No. 10, pp. 502, 503, fig. 1*).—This is a review of recent progress made in the oxidation of ammonia, together with a more detailed account of the investigational work which led to the development of the experimental plant built at Syracuse, N. Y., by the U. S. Bureau of Mines in cooperation with a commercial concern.

**Further contribution regarding the physiological action of ammonium salts on plants, II**, H. G. Söderbaum (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 178 (1918), pp. 12, fig. 1; also in K. Landtbr. Akad. Handl. och Tidskr., 57 (1918), No. 7–8, pp. 513–521, fig. 1; abs. in Chem. Abs., 13 (1919), No. 10, p. 1120*).—Further pot experiments (E. S. R., 38, p. 121) are reported to determine the limits of the harmful effect of ammonium sulphate and sodium nitrate, alone and mixed, on oats, barley, vetch, and Italian rye grass on sand soil.

It was found that for oats the limiting amount of ammonia nitrogen was between 142 and 178 lbs. per acre, and for barley between 36 and 53 lbs. per acre. With rye grass no harmful effects were observed up to 178 lbs. per acre. With vetch the effect of ammonium sulphate was most pronounced, the smallest amounts used in any pot decreasing the plant growth. Vetch was also sensitive to sodium nitrate, but in less degree than to ammonium sulphate.

**An afterwar fertilizer, ammonium nitrate**, L. Malpeaux (*Vie Agr. et Rurale, 8 (1918), No. 45, pp. 335–339*).—Tests of ammonium nitrate and ammonium sulphate on three different soils showed that the ammoniacal nitrogen of the ammonium nitrate is not so well retained by the soil as that of the sulphate, but that the nitrate contents of the soils were increased more by the ammonium nitrate. Ammonium nitrate gave about the same results in this respect as sodium nitrate.

In pot experiments with oats the best total results were obtained with ammonium sulphate. Ammonium nitrate gave slightly better results than sodium nitrate, although the weight of grain obtained with the latter was somewhat greater.

Plat experiments with oats, sugar beets, and potatoes using sodium nitrate, calcium nitrate, ammonium nitrate, ammonium sulphate, and cyanamid showed that calcium nitrate gave the best results for oats, followed closely by sodium nitrate. Ammonium nitrate and cyanamid gave about the same results with oats, which were only slightly less than with the two better fertilizers. All the fertilizers gave a marked increase over unfertilized soils. Ammonium nitrate gave the best results with sugar beets, but marked increases were obtained in all cases. With potatoes calcium nitrate gave the best results, which, however, were only slightly superior to those obtained with sodium nitrate and ammonium nitrate.

It is concluded that ammonium nitrate is a very active fertilizer and should be classed with sodium nitrate and ammonium sulphate in this respect.

It is further concluded from these experiments that the choice of a nitrogenous fertilizer should be governed by price, availability, and nature of the soil.

**Influence of dicyandiamid on plant growth**, E. Johnson (*Tidskr. Kemi, 15 (1918), pp. 349–367, 369–393; abs. in Chem. Abs., 13 (1919), No. 12, p. 1354*).—

Cropping experiments were conducted with three nitrogenous fertilizers called lime nitrogen and cyanamid, but consisting of mixtures of cyanamid, dicyandiamid, and urea, and with pure dicyandiamid.

The results obtained corresponded to the content of the fertilizers in urea and dicyandiamid and, allowing for the inhibitory influence of the dicyandiamid, followed the Mitscherlich law of minimum. A small percentage of dicyandiamid did not retard straw and grain yield and, with an increase of nitrogen in the fertilizer, there was a greater relative yield in grain than in straw. This was true for mixtures in which the dicyandiamid represented 35 per cent of the total nitrogen. Pure dicyandiamid did not increase crop growth and is considered possibly as injurious. It is thought that favorable influences attributed to dicyandiamid in previous work may have been due entirely to associated urea.

**The biological determination of the relative availability of different nitrogenous organic manures in black cotton soil,** F. J. Plymen and D. V. Bal (*Agr. Jour. India, 14 (1919), No. 3, pp. 414–421*).—Studies on the bacterial transformation of six common oil cakes and of an oil-free cake in black cotton soil of the Deccan are reported.

With the exception of the oil-free cake, karanja (*Pongamia glabra*) and cotton cakes appeared to be by far the most quickly available, and castor cake was not much inferior to them. Til cake (*Sesamum indicum*) was not quite so active, although the nitrogen ultimately nitrified compared favorably with that of other cakes. With the exception of mahua cake (*Bassia latifolia*), sarson cake (*Brassica napus*) was the slowest so far as nitrifiability in black cotton soil is concerned. The nitrogen in mahua cake was neither ammonified nor nitrified to any appreciable extent during a period of eight weeks.

**The value of phosphate manures in India and the possibility of their manufacture on a larger scale,** W. A. Davis (*Agr. Research Inst. Pusa Bul. 81 (1918), pp. IV+28*).—This is a report of a committee made up of a number of reports by individual members and others. Conclusions drawn by the committee from these reports are that not sufficient evidence is available to indicate definitely that any deterioration of the soil arising from depletion of phosphates has occurred generally throughout India, except in the case of the indigo soils of Bihar.

With reference to the effects of phosphatic fertilization in the different Provinces, the reports indicate that "in the indigo districts of Bihar such manuring is plainly beneficial.

"In Bengal and Assam, on the old alluvium, there is ample evidence that phosphatic manuring is of value and has given considerable increase with paddy (40 per cent), mustard, and other crops. On the old alluvium, lime is also deficient and is probably necessary to enable phosphates to produce their maximum effect. On the silt alluvium, evidence is variable and no general conclusion can be drawn. Pending further investigations on the tea garden soils evidence shows that phosphatic manures are of great value. Basic slag and basic superphosphates give the best results. Bone manures and mineral phosphate when applied to the soil have not given noticeable results, except indirectly, through green crops.

"In the United Provinces, in the eastern districts on opium soils, it is possible that phosphate manuring may be useful. There is no evidence of phosphate deficiency in other areas. In the Punjab, results appear to indicate that very little benefit is at present found in the use of phosphatic manures in most of the ordinary systems of agriculture adopted in that Province.

"In Burma, soils of the delta show great variations. In some areas the phosphate supply is ample, in others deficient. In general, however, it ap-

pears that phosphates will probably prove to be an essential manure in the great rice-growing areas of Burma.

"In Madras, experiments with phosphatic manuring have been chiefly made with paddy. Marked deficiency in available phosphate is chiefly noticeable in old paddy soils. All forms of phosphates have yielded marked results. On the laterite high lands chiefly devoted to planting crops, tea, coffee, and rubber, paying results have been obtained by the use of basic slag and basic superphosphates.

"In Bombay, the need for phosphate was most felt in the rice lands of the Konkan, both superphosphate and bone meal repaying the cost of application. Outside this area the scarcity of nitrogen and organic matter appears to be the limiting factor, except possibly in the case of leguminous crops, notably lucerne. In the case of cane, phosphate alone has given poor results, but when used as a manure on a preceding green dressing crop the subsequent yield of cane was increased. Early ripening and greater purity of juice were noticed.

"In the Central Provinces there appeared to be no indication of the need of phosphate in the black cotton soils. On the light soils of the Province it has proved valuable in the case of paddy, sann-hemp, and cane. Experiments have not gone far enough to indicate which form of phosphate is preferable. . . .

"Taking India as a whole, there are sufficient supplies of phosphatic manures from all sources to meet the present demands, but there are isolated localities where the question of the supply of superphosphate in the immediate future appears to be important."

**Phosphate rock in 1918**, R. W. Stone (*U. S. Geol. Survey, Min. Resources U. S., 1918, pt. 2, pp. 11+199–222*).—This report deals with the production and sale of phosphate rock in the United States and other countries during 1918, and with the distribution and character of deposits.

The phosphate rock marketed in the United States in 1918 amounted to 2,490,760 long tons, valued at $8,214,463. As compared with the production in 1917, there was a decrease in quantity of 93,527 tons and an increase in value of $443,379. The quantity mined in 1918 was 2,284,245 long tons, a decrease of 567,641 tons from the output of 1917.

The decrease in production was general. In Florida the decrease was 443,247 tons, or 19 per cent, with 28 plants in operation, 9 less than in 1917; in South Carolina 11,868 tons, or 26 per cent, with 3 producing plants, as in 1917; in Tennessee 108,160 tons, or 23.8 per cent, with 21 plants in operation, 2 less than in 1917; and in the Western States 4,479 tons, or 27 per cent, with 3 producers instead of 4.

**Triplite: A possible source of phosphoric acid**, A. E. V. Zealley (*Rhodesia Munitions and Resources Com. Rpt. 1918, pp. 41–43*).—This is a brief note on the occurrence in Rhodesia of triplite, a fluor-phosphate of manganese and iron normally containing 30 to 35 per cent of phosphoric acid. It is said to be easily soluble in hydrochloric acid and readily fusible, and occurs in a deposit mined for the recovery of bismuth ore. Possibilities for the recovery of triplite as a by-product of this process are discussed.

**On the manner of occurrence of potassium nitrate in Oregon**, T. Nattress (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 57, 58*).—This is a short note on the potassium nitrate deposits in the Lake Lahontan region in Oregon.

Samples taken from the bluff surfaces contained potash, sodium nitrate, and potassium nitrate. Independent sampling done with consideration for the bulk contents of the rock strata showed an average content of from 4 to 6 per cent of potassium nitrate. "Weathering of the native rocks of the greater

drainage area must be admitted to be the principal source of the supply and the explanation of the uniformity that prevails in the deposit."

**Separation of potash salts**, H. P. BASSETT (*Chem. and Metall. Engin., 20 (1919), No. 2, pp. 76, 77*).—The author discusses methods of separation of potash salts from lake brines, containing roughly equal amounts of potassium sulphate, sodium sulphate, and sodium carbonate, with a view to obtaining marketable products from the remaining salts. This is considered entirely feasible.

**Potash production in Russia** (*New York: Cent. War Indust. Com. Russia: Amer. Delegation [1918], pp. 6*).—This report states that the main sources of Russian potash are the ashes of stalks of sunflowers. In 1911 the production was 26,465,580 lbs., and it is stated that at present the main regions of production are Northern Caucasia and the Saratov region. The estimated total annual production in Northern Caucasia during 1915 to 1917 was 30,000,000 to 35,000,000 lbs. of potash containing from 88 to 90 per cent of potassium carbonate, while the annual production for the same period in Saratov was from 5,000,000 to 7,000,000 lbs. of potash containing from 78 to 80 per cent of potassium carbonate. It is estimated that 10,000,000 lbs. of Russian potassium carbonate were imported into the United States during 1918.

**Limestone action on acid soils**, R. STEWART and F. A. WYATT (*Illinois Sta. Bul. 212, abs. (1919), pp. 7*).—This is an abstract of Bulletin 212 of the station (E. S. R., 40, p. 423).

## AGRICULTURAL BOTANY.

**Plant physiology**, R. C. KNIGHT (*Sci. Prog. [London], 13 (1919), No. 52, pp. 561–566*).—This is a review of recently published investigation and opinion bearing upon transpiration and related activities and conditions in plants.

**Plant physiology**, V. H. BLACKMAN (*Sci. Prog. [London], 13 (1918), No. 49, pp. 49–53*).—This is chiefly a review of the data reported by Coons (E. S. R., 34, p. 647), with interpretative comments.

**Plasmolysis of epidermal cells in petals of tulip**, A. GUILLIERMOND (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 8, pp. 427–431, figs. 12*).—Studies previously noted (E. S. R., 39, p. 734) as carried on with *Iris germanica* have been repeated with *Tulipa suaveolens*, which is in some respects even more favorable to the demonstration of certain structures and changes. The phenomena as detailed are said to be fairly comparable with those described in the previous account.

**The activation of buds in the Compositæ**, G. BOHN (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 8, pp. 440–442*).—It is claimed that forcing growth of buds by employment of any one or more of different factors (as etherization, etc.) may produce results of the most various kinds in different species. The operation of these factors may be dependent upon the characters of such factors, and independent of the quantity or quality of the nutriment placed at the disposal of the plants.

**Bud formation of plant hypocotyls**, F. R. CLARK (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), p. 146*).—Seedlings of various kinds which do not usually produce buds along the internode of the hypocotyl were deprived of their tops just below the cotyledons, leaving only the internode of the hypocotyl above the ground. Practical regeneration of the top occured in *Solanum dulcamara*. The arrangement of the parts of the new top was similar to that of normal plants grown in the same pots.

**Study of the artificial absorption of glucose by the mulberry tree through its aerial parts**, C. ACQUA (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 14 (1916–17), pp. 8, pl. 1, figs. 2*).—Summarizing results of earlier studies (E. S. R., 36,

p. 328) and describing later observations on the absorption of nutriment through aerial portions by the mulberry, the author concludes that in very small plants glucose solution produces distinct acceleration, the development including also morphological variations internally and externally. In somewhat older plants the differences produced are less striking, but are still distinct. In still older plants the differences produced are very slight. These observations are said to agree with those of Molliard (E. S. R., 35, p. 633) regarding the morphogenetic influence of sugar.

**Behavior of plants in unventilated chambers**, F. C. Newcombe (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 145, 146*).—During three years, laboratory tests have been made giving data bearing on the hypothesis that plants thrive best when well ventilated. The results of three series of experiments are given, leading to the conclusion that plants are not materially benefited by ventilation.

**[The relations between temperature and the seasonal progress of vegetation]**, G. Ritter (*Bot. Centbl., Beihefte, 35 (1917), 2. Abt., No. 2–3, pp. 568–577, fig. 1*).—The author gives data obtained from observations on seasonal behavior of a number of plants in the vicinity of Bremen in regard to such phenomena as the appearance of blooms, leaves, ripe fruits, leaf coloration, and leaf fall. A study of correlations is considered to indicate a close correspondence between these phenomena and those of climate and of weather, more particularly during the earlier part of the growing season.

**Demonstration of methods for the study of stomatal action**, M. Pengelly (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), p. 154*).—These methods were related to work employing, respectively, Darwin's porometer, the hygrometric paper tests, and direct examination with the microscope.

**Conductivity as a measure of permeability**, W. J. V. Osterhout (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 485–487*).—A study of a green alga (Ulva) and of a marine flowering plant (Zostera), both of which have cellulose walls, by the electrical conductivity method is said to show that this method measures permeability just as other methods do, but that the method herein used is more accurate and more convenient. This makes it possible to determine conductivity at shorter intervals, thereby detecting any rapid changes which may occur and determining the time curve with greater precision than is otherwise possible.

**Note on the effect of diffusion upon the conductivity of living tissue**, W. J. V. Osterhout (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 489, 490*).—Having noted exceptions to the rule that electrolytes produce in living tissues either a rise in resistance followed by a fall, or merely a decrease in resistance, the author describes a case in which the effects noted are ascribed to diffusion.

**A method of measuring the electrical conductivity of living tissues**, W. J. V. Osterhout (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 557–568, figs. 8*).—The author gives an account of a method employed in studies such as those above noted to determine the electrical conductivity of living tissues of organisms, claiming that under favorable conditions the results do not vary more than 1 per cent from the mean of the measurements.

**A comparative study of permeability in plants**, W. J. V. Osterhout (*Jour. Gen. Physiol., 1 (1919), No. 3, pp. 299–304, figs. 2*).—Studies measuring permeability (as in those above noted) which were carried out with a brown alga (Laminaria), a green alga (Ulva), a red alga (Rhodymenia), and a flowering plant (Zostera), are said to have shown essential similarity in respect to the changes in permeability occurring in these plants.

**The relation between the structures of some coniferous woods and their penetration by preservatives**, P. C. Kitchin (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 203–221, pls. 2*).—This work, suggested by one of the conclusions

reached by Teesdale in work previously noted (E. S. R., 31, p. 743), is said to have shown that *Larix laricina* and *L. occidentalis*, while similar in most characters, are dissimilar in those structures most concerned in the passage of creosote into the wood. The similarity is thought to be due to differences in penetrable bordered pit areas. Additional data bearing upon work of Teesdale are given in the appendix to the main report.

**Salt ratios in soil cultures**, R. P. HIBBARD (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 147–150*).—This is a brief account, with discussion of indications and bearings, regarding the work which has been previously noted (E. S. R., 39, p. 419).

**[Mineral nutrient solution for maize]**, P. MAZÉ (*Ann. Inst. Pasteur, 33 (1919), No. 3, pp. 139–173, figs. 8*).—Work previously noted (E. S. R., 33, p. 522; 34, p. 525) has been followed up with studies on the nutritive requirements of maize.

It is claimed that boron, aluminum, fluorin, and iodin are indispensable to the development of maize in the same sense as are nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, chlorin, silicon, magnesium, and zinc, this fact raising the number of known elemental constituents to 18, including the more abundant ones carbon, hydrogen, and oxygen. It is thought that data obtained in this part of the work may give useful suggestions looking to more direct and practical work along these and closely related lines. The influence of organic matter, of aeration, and of the oxidation of iron are also systematically reported.

The utility of sodium in relation to growth is regarded as not yet established. It is thought that the facts here noted, with discussion, indicate the possibility of placing the elements which enter into nutritive solutions in two categories, one containing those elements which condition organization, the other, those which tend to prevent intoxication due to the accumulation of certain compounds formed during the stages of transformation into substances destined to become nutritive.

**Plant ecology and its relation to agriculture**, W. G. WATERMAN (*Trans. Ill. Acad. Sci., 10 (1917), pp. 123–129*).—This is a brief systematic discussion regarding the nature, content, and scope of general ecology, and of the special ecology of structural groups; also regarding the relation of ecology to agriculture, the nature of contributions to ecology with illustrations, and the proper place of ecology in agricultural study.

**Dwarf shore floras**, H. W. CLARK (*Trans. Ill. Acad. Sci., 10 (1917), pp. 145–159, pls. 4, figs. 2*).—A list is given, with notes, of the species making up the dwarf flora as noted in October, 1914, along the shore of the Mississippi River near the Fisheries Biological Station at Fairport, Iowa.

The individual dwarfing of upland plants, although referred to shortness of their growing season as the principal cause, is thought to offer a complex and diversified problem assignable to several other causes, among these inhibition of root development by excess of soil moisture.

**Notes of the introduced flora of the Douglas Lake region**, H. A. GLEASON (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), p. 153*).—It is stated that within a few miles of Douglas Lake, Mich., occur more than 100 species of introduced plants, their local distribution showing that they are almost completely dependent upon man for their dispersal and that they are unable to compete with the native plants under natural conditions. The fluctuations in the number of individuals from year to year suggest a close relation to climatic conditions. Areas occupied almost completely by introduced species soon develop into a closed association in which *Poa pratensis* is the dominant plant.

**Notes on the Michigan flora**, O. A. FARWELL (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp 161–195*).—This paper begins a series intended to give notes and discussion from time to time on rare or interesting Michigan plants. This series is practically a continuation of the contributions to the botany of Michigan begun in the *Asa Gray Bulletin*, which has been discontinued.

**A botanical trip to Mexico, I–II**, A. S. HITCHCOCK (*Sci. Mo., 8 (1919), Nos. 2, pp. 129–145, figs. 19; 3, pp. 216–238, figs. 21*).—Besides notes on topography, climate, rainfall, and temperature, the author gives in the first part of this contribution an account of botanical and agricultural observations in Mexico, including floral regions, range conditions, and forage crops. The second part deals with the common wild grasses of Mexico, more particularly with regard to such topographical features as coastal plains, plateaus, mountains, ponds, and marshes.

**Note on inheritance in Phaseolus**, W. E. BROTHERTON, JR. (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), p. 152*).—Hybrids between three bush varieties of *P. vulgaris* and the scarlet runner, tall variety of *P. multiflorus*, gave in the $F_1$ a decrease of 50 per cent in length of hypocotyl as compared with that of the maternal parent and an increase in length of epicotyl of 100 per cent as compared with that of the bush parent, but no change in the height of the hybrid. Long hypocotyl as found in the races of *P. vulgaris* is incompletely dominant to short hypocotyl as found in *P. multiflorus*.

It is suggested, therefore, that length of hypocotyl may afford a criterion of the classification of $F_2$ segregates. It in considered incorrect to speak of hypogeal cotyledons as dominant to epigeal in this connection, since the position of the cotyledons in relation to the surface of the earth may depend largely on other than genetic factors. The essentially genetic factors are those which determine the length of the hypocotyl, rather than the position of the cotyledons in relation to the earth's surface.

**A case of Mendelian segregation in Œnothera pratincola**, F. COBB and H. H. BARTLETT (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), p. 151*).—The authors give details regarding results obtained from crossings between mutants appearing in the progeny of *Œ. pratincola* as previously noted (E. S. R., 35, p. 128).

**Studies in the classification and nomenclature of the bacteria, VIII–X**, R. E. BUCHANAN (*Jour. Bact., 3 (1918), Nos. 4, pp. 403–406; 5, pp. 461–474; 6, pp. 541–545*).—Three papers have been added following up those previously noted (E. S. R., 40, p. 521), dealing respectively with The Subgroups and Genera of the Actinomycetales, The Subgroups and Genera of the Thiobacteriales, and Subgroups and Genera of the Myxobacteriales and Spirochætales.

**Comments on the evolution and classification of bacteria**, R. S. BREED, H. J. CONN, and J. C. BAKER (*Jour. Bact., 3 (1918), No. 5, pp. 445–459*).—This is a critical examination, with references, of the several groups of bacteria as proposed by the committee appointed by the Society of American Bacteriologists and consisting of Winslow et al. (E. S. R., 37, p. 819), and as suggested by other authors named (in connection with their contributions).

**Bacteria which survive in fractional sterilization**, E. ECKELMANN (*Centbl. Bakt. [etc.], 2. Abt., 48 (1918), No. 5–9, pp. 140–178, pls. 2, figs. 5*).—The study here described of bacteria as regards their powers of resistance to sterilizing agents shows that bacteria resistant to such agents are to be found in many different situations, though the reasons for their absence in certain cases have not been determined.

Physiological relations seem to exist between species in widely separated regions. Germinability and resistance of spores were unimpaired in some cases cited, after 13 years of preservation in a dry condition. Difficulty of

sterilization appears to be due largely in some cases to lateness or slowness in germination, though occasionally the production of new spores seems to be influential in this respect. The surest means to exterminate bacteria with temperatures not exceeding 100° C. is to subject the medium several times to high temperatures on successive days, with room temperature during the intervals. High degrees of resistance possessed by spores are due predominantly to impermeability of their membranes.

After repeated infection in liquid media (during two to five months) the spores lost the power of resistance due, apparently, to the increase of permeability of their membranes and their resulting too great readiness to germinate. After drying on soil, sand, or kaolin for a few weeks resistance may reappear in such spores. The species studied were aerobic, germinability being rapidly decreased by lowering the oxygen pressure and increased by restoration of the normal oxygen supply.

**Studies on the proteolytic enzyms of soil fungi and Actinomycetes**, S. A. WAKSMAN (*Jour. Bact., 3 (1918), No. 6, pp. 509–530*).—Employing in the present investigation methods of isolation and description of soils identical with those used in a former contribution (E. S. R., 36, p. 214), the author has made a study of a number of organisms isolated from different soils, chiefly of *Aspergillus niger*.

It is stated that the proteolytic enzyms contained in the fungi studied appear to differ from known proteolytic enzyms of animal origin inasmuch as they have a greater range of optimum reaction and a lower temperature optimum. They are not precipitated by safranin. The exoenzyms can pass through a Pasteur-Chamberland filter. Their production of proteolytic exo- and endoenzymos (as regards *A. niger*) is not affected by the sugar content of the medium. Both exo- and endoenzyms are produced by microorganisms on protein-containing and protein-free media. The age of the culture at which the most active enzyms are obtained depends on the organism itself, its rapidity of growth, and the nature of its waste products. Fibrin and crystalline egg-albumen are decomposed by both the exo- and endoenzyms. The fact that small quantities of ammonia are produced in the decomposition of peptone and casein by the proteolytic enzyms of the microorganism suggests the presence of desamidases among the enzyms produced.

## FIELD CROPS.

**Crop rotation and soil fertility**, R. C. DONEGHUE (*North Dakota Sta. Bul. 126 (1918), pp. 197–251, figs. 13*).—The first part of this bulletin (pp. 197–216) deals with a study of cropping systems for the Red River Valley of North Dakota made during the 7-year period of 1910–1916, in an effort to determine the income that could be obtained when crops were placed in a rotation where the value of each crop could be fully realized. Various five and six year rotations have been followed, while observations have also been made on plats grown continuously to brome grass for 11 years, to wheat for 34 years, and to alfalfa for 5 years. The effect of manure on the various crops is also noted. The yields and estimated values of the crops are presented in tabular form and the results secured summarized as follows:

The black clay soil of the Red River Valley has deteriorated in fertility and crop producing capacity under a system of continuous cropping with wheat. Such land on the station farm contains approximately one-fourth to one-third less nitrogen and one-fifth less phosphorus than virgin soil of the same type. The yield during the last eight years has been 28 per cent less than during the first eight years of a 24-year period. A total application of 135 tons of

manure per acre to brome grass during a period of 11 years produced an increase of 72 per cent in yield of hay, and of 22 per cent of nitrogen and 33 per cent of phosphorus in the surface 7 in. of soil. The increase in yield thus far obtained is estimated to be worth 60 cts. for each ton of manure applied.

Clover has produced a higher yield of hay than timothy, and the yields of succeeding crops of wheat and corn have been higher after clover. As an average of the 3 years, 1914–1916, in which clover and timothy were followed by wheat and corn the clover rotation is estimated to have produced a gross income of $13.61 per acre more than the timothy rotation. Clover is also said to be a more profitable crop in the rotation than peas. In 1914 clover produced 3.22 tons more hay per acre than peas, and in 1915 wheat following clover yielded 6.9 bu. per acre more than that following peas.

The highest average income, $29.01, was secured from a six-year rotation consisting of potatoes, wheat, barley, and alfalfa 3 years. Owing to the failure of alfalfa in 1910 and 1911 the average income on the duplicated plat of this rotation was only $18. In the second ranking rotation, consisting of corn, wheat, barley, clover, and wheat, when two cuttings of clover were obtained the average annual gross income was $24.49 per acre. On account of the better distribution of labor and the larger acreage of grain the latter rotation is deemed better suited to Red River Valley conditions.

Wheat, barley, timothy, brome grass, and potatoes responded to applications of farm manure, the average value of the increased yield being $1.16 for each ton of manure during a period of 3 years. Clover, peas, and alfalfa have not responded to applications of manure.

It is estimated that the increase from one ton of rotted manure has been worth $1.22 as an average of five plats, and the average increase on seven plats from one ton of fresh manure worth $1.13. Considering the cost of the extra handling of rotted manure, it is regarded as more profitable to haul the manure directly from the barn to the field.

The second part of the bulletin (pp. 216–251) has to do with studies made in connection with a series of experiments previously described (E. S. R., 28, p. 338). These studies were planned in an effort to ascertain the effects of German millet, broom corn millet, corn, potatoes, and bare fallow on wheat grown in rotation with them, and also the influence of these crops upon the soil moisture and available nitrogen supply of succeeding wheat crops. Observations were made during the growing seasons of 1911–1913, inclusive, on the moisture and nitrate content of the soil at different stages in the growth of crops in various places in the rotation, and the data are presened in tabular form. The results secured may be summarized as follows:

German millet and broom corn millet improved the condition of the soil for wheat when the land was comparatively new and free from weeds. Where such a cropping system was followed continuously, however, the yield of wheat was reduced. In these experiments the second and third wheat crops following millet have frequently yielded more than the first crop where this cropping system had been practiced for 8 years or more, this being specially noticeable when the first wheat crop was preceded by a heavy crop of millet.

The growing of corn once in four years resulted in the maintenance of the yield of the first and second wheat crops following the corn, but the yield of the third crop decreased. The beneficial effects of the corn crop extended over a shorter time on old land than on new land, as indicated by the fact that the first wheat crop yielded 5.72 bu. more than the third crop in the last four years of the experiment while the preceding 4-year period it yielded but 1.95 bu. more.

The effect of potatoes in the rotation was similar to that of corn. Fallowing also produced much the same effect, except that the first wheat crop yielded less and the third one more than when grown in a similar place in the rotation with corn or potatoes. There was a greater growth of straw when wheat was grown on fallow land than occurred on potato land, and more on potato land than on corn land. In specially favorable years more grain was produced with the greater growth of straw, but the results are held to indicate that ordinarily more grain is produced on corn land than on potato or fallow land for the conditions under which this work was carried on.

Soil moisture determinations in 1912 and 1913 showed that German millet and broom corn millet used similar amounts of water from the top 3 ft. of soil. More water was used in producing a bushel of wheat in the crop following millet than was used by the second, and more by the second than by the third crop of wheat following millet. Wheat was produced with less loss of water from the top 3 ft. of soil when it followed corn than when grown after millet. As an average of three crops, a bushel of wheat was produced with 18.4 tons less water than in the German millet rotation and 14.8 tons less than in the broom corn millet rotation. The first wheat crop following corn required less water than the second and the second slightly less than the third. More water was used from the top 3 ft. of soil for the production of a bushel of wheat when potatoes took the place of corn in the rotation, but less than was used in the millet rotations. The first wheat crop following the potatoes was produced with the least water, the amount increasing with each succeeding wheat crop. Wheat grown on fallow required more water for each bushel produced than when grown on corn or potato land, but less than when grown on millet ground if no account was taken of the loss during the year in which it was fallowed. As an average of two years this loss amounted to approximately 6 in. of rainfall.

The growing of millet seemed to favor the accumulation of nitrates more than the growing of wheat, but the heavy demands of the millet crop sometimes reduced the nitrate content of the soil to a low point. Nitrates accumulated more rapidly in corn, potato, and fallow land than where millet was grown. When measured by the amount of nitrogen used by the crop and the amount remaining in the soil in the form of nitrates, there was less available nitrogen produced in the wheat land the first year following millet than there was the second year. The amounts produced the third year following millet were practically the same as for the second season. The available nitrogen produced in soil growing the first crop of wheat after corn or potatoes was greater than when either the second or third crop was grown.

Finally it is concluded that, "for the black clay soil of the Red River Valley, the beneficial effect of corn and potatoes in the rotation is due largely to the greater amount of nitrogen made available during the growing season of succeeding crops and greater economy in the use of plant food and soil moisture. The better soil structure after a cultivated crop has been grown probably favors nitrification and permits a more complete and uniform distribution of the crop roots through the soil mass. The eradication of weeds is an important factor in the improvement of soil structure and the economy of plant food and soil moisture."

[Report of field crops work at the Hettinger, N. Dak. substation, 1913–1918], W. R. Lanxon, A. J. Ogaard, and U. J. Downey (*North Dakota Sta. Bul. 130 (1919), pp. 9–12, 14–20, 21–23, 25–28, 36–49, 50–53, 55, 56*).—This comprises a report on variety, rotation, and cultural tests with wheat, oats, barley, potatoes, flax, and corn, and field tests with buckwheat, alfalfa, sweet clover, red clover, brome grass, millet, Sudan grass, field peas, soy beans, chick-peas, kaoliang, emmer, hemp, and Dakota amber sorghum.

The results secured with wheat are held to indicate that diversified farming is more profitable than where the farmer depends upon wheat alone. Under a system of mixed farming it is recommended that wheat be grown on disked corn land rather than on fallowed land. Kubanka No. 8 durum and Marquis Fife are regarded as the most dependable sorts for this region. Wheat proved to be more profitable than oats, although the latter is better adapted for growing after small grains in the rotation. Medium early varieties of oats are deemed best. Barley failed to produce as high a money return as either wheat or oats. Varieties of the two-rowed class of barley are regarded as best adapted to this locality. The best average results with flax are thought to be secured on virgin sod breaking, while plantings on brome grass breaking were scarcely profitable. Satisfactory results were secured on disked corn stubble. North Dakota No. 155 flax has given the best results.

Northwestern Dent corn is said to be the best sort for general purposes, while for hogging off Gehu and Dakota White flint were successfully grown. Spring plowing is deemed preferable to fall plowing for corn, while data have been secured which are held to indicate that cultivation to maintain a dust mulch is of less importance than for the removal of weeds.

The Early Ohio potato is regarded as the best general purpose sort, while Irish Cobbler has also given good results.

[Report of field crops work in Montserrat, 1917–1918], F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept., Montserrat, 1917–18, pp. 3–12, 15, 16, 19–28, 35–37, 38*).—This describes the continuation of work previously noted (E. S. R., 40, p. 228), embracing breeding, spinning, cultural, and fertilizer tests with cotton; variety tests with sugar cane; observations on the utilization of the ajowan plant (*Carum copticum*) and of American horsemint (*Monarda punctata*) as sources of thymol, and of *Datura metel* as a source of scopolamine; notes on peas, beans, peanuts, sweet potatoes, and yams; and information relative to the cotton and sugar industries.

[Report of field crops work at the St. Kitts-Nevis experiment stations, 1916–17 and 1917–18], F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Kitts-Nevis, 1916–17, pp. 2–11, 13–16, 30–36, 37, 38; 1917–18, pp. 2–14, 16–18, 32–39, 40, 41, figs. 6*).—These reports describe the progress of work conducted along the same general lines as previously noted (E. S. R., 38, p. 33), embracing variety and field tests with corn, yams, eddoes, beans, peas, sweet potatoes, peanuts, cassava, and castor bean, and manurial and seed selection tests with cotton. Information relative to the sugar and cotton industries is also included.

[The Woburn field experiments, 1918], J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 263–276*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 40, p. 824). The season of 1917–18 is said to have been rather unfavorable.

The maximum yield in the continuous wheat experiments, 28.3 bu. of grain and 2,447 lbs. of straw per acre, was secured from the plat receiving mineral manures and sulphate of ammonia with one ton of lime applied in 1905. The plat receiving rape dust equivalent to 25 lbs. of ammonia was next with 28.1 bu. of grain and 2,777 lbs. of straw. The average yield for the untreated checks amounted to 14 bu. of grain and 1,405 lbs. of straw. Mineral manures alone produced 14.6 bu. of grain and 1,603 lbs. of straw. Nitrate of soda failed to show any superiority over sulphate of ammonia, while farmyard manure was slightly inferior to rape dust. Phosphates without potash produced 15.5 bu. of grain and 1,418 lbs. of straw, while potash without phosphate produced 12.9 bu. of grain and 1,193 lbs. of straw.

The highest yield in the continuous barley experiments was secured from the plat receiving farmyard manure and amounted to 35.1 bu. of grain and 2,238 lbs. of straw, followed by the plat receiving mineral manures and, in alternate years, nitrate of soda with a yield of 27 bu. of grain and 1,555 lbs. of straw. The average yield for the untreated checks was 8.6 bu. of grain and 587 lbs. of straw. Mineral manures alone failed to give any increase in yield although a slight increase was secured on the limed portion of the plat. Sulphate of ammonia alone again gave no weighable return, while the addition of large amounts of lime (4 tons) resulted in an increased yield. Nitrate of soda used alone at the rate of 2 cwt. (224 lbs.) per acre gave satisfactory results. Rape cake proved to be a failure with barley. Phosphate without potash produced 24.3 bu. of grain and 1,365 lbs. of straw and potash without phosphate 25.4 bu. of grain and 1,547 lbs. of straw.

Observations on the comparative effect upon barley yields of the unexhausted residues from so-called cake and corn feeding on the rotation plats showed a yield of 21.8 bu. of grain and 1,431 lbs. of straw for the corn-fed plat and 18.2 bu. of grain and 1,496 lbs. of straw for the cake-fed plat.

Wheat following green crops of tares, rape, and mustard which had been fed off produced at the rate of 12.2, 15.3, and 15.2 bu. of grain per acre, respectively.

In the improvement of old grassland, the best results were again secured from an application of 12 tons of manure per acre made in 1913 with a yield of 3,870 lbs. of hay, as compared with 3,668 lbs. for the untreated check. Various kinds of lime for grassland have been compared, the highest yield, 3,808 lbs. of hay per acre, being secured from Lias lime applied in 2-ton lots in 1910 and again in 1916. The untreated check produced 3,752 lbs. of hay. Comparing different forms of lime for grass, ground chalk gave the highest yield, 3,836 lbs. of hay, and the untreated check 3,360 lbs.

**[Report of field crops work in Mysore, 1916–17]**, L. C. Coleman (*Rpt. Agr. Dept. Mysore, 1916–17, pp. 2–6*).—Variety, fertilizer, and cultural experiments with sugar cane are briefly described and field tests with miscellaneous crops noted.

**[Report of field crops work in the United Provinces, India, 1918]**, B. C. Burt (*Rpt. Agr. Expt. Stas. Cent. Circle, United Provs. [India], 1918, pp. 1–25, 32–34, 38, 39, 43–45, 50–59, 65–70, 74, 75*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 40, p. 332).

**Grain yields for 1919**, E. B. Stookey (*Washington Sta., West Wash. Sta. Mo. Bul., 7 (1919), No. 7, pp. 105, 106*).—The yields of the leading varieties of barley, oats, and wheat grown at Puyallup during 1919 are given, together with their average yields for a period of years.

Barley yielded at the rate of from 23.38 bu. per acre for Beardless to 39.8 bu. for Hannchen for a 3-year period. Gray Winter oats sown in the fall produced 48.17 bu. for a 4-year average as compared with yields of spring varieties ranging from 49.77 bu. for Swedish Select to 60.6 bu. for Minnesota No. 281. The 4-year average yields of spring wheat ranged from 18.21 bu. per acre for Marquis to 22.42 bu. for Mexican Bluestem, and of winter wheat from 33.43 bu. for Little Club to 35.23 bu. for Red Russian. Red Russian seeded at the rate of 1.5, 2, and 2.5 bu. per acre produced at the rate of 31.25, 35.2, and 36.75 bu. per acre, respectively.

Statistical notes on cereals (*Internatl. Inst. Agr. [Rome], Bur. Statis., Doc. Leaflets, 3 (1919), No. 6, pp. 88*).—Statistical information is presented dealing with the yield, trade, consumption, prices, and rates of ocean freight for wheat, rye, barley, oats, corn, and rice throughout the world for the 1918 crops of the Northern Hemisphere and the 1918–19 crops of the Southern Hemisphere. In-

formation is also given relative to legislative measures adopted in various countries concerning the production, trade, and consumption of cereals.

[Fiber plants of Brazil], M. P. Corrêa (*Fibras Texteis e Cellulose. Rio de Janeiro: Min. Agr., Indus. e Com., 1919, pp. XV+276, pls. 31, figs. 51*).—This comprises a detailed account of textile fibers and of paper-making materials found in Brazil.

The agaves, A. Berger (*Die Agaven. Jena: G. Fischer, 1915, pp. VII+288, figs. 81*).—This comprises a monograph on the agaves. Three subgenera, Manfreda, Littæa, and Euagave, are recognized, and 274 species described. A brief note on the cultivation of agaves is included.

Australian saltbush, R. McKee (*U. S. Dept. Agr. Bul. 617 (1919), pp. 12, figs. 4*).—This comprises an account of the distribution, climatic and soil requirements, drought resistance, diseases, seeding, harvesting, and utilization of Australian saltbush (*Atriplex semibaccata*), said to have been introduced into the semiarid regions of the United States about 25 years ago.

Plantings failed in practically all cases except along the coast and in the San Joaquin and Imperial Valleys of California, and in the Salt River, Yuma, and Santa Cruz Valleys of Arizona. The plant was found to be tolerant of alkali and quite drought resistant, although not to the same extent as other species of Atriplex and other desert plants. While not so palatable as most forages, the crop is said to be readily eaten by sheep, goats, cattle, and horses when other feeds are scarce, having its greatest value as a succulent feed in late summer. It is also regarded as a suitable soiling crop, but of little value for hay.

The cultivation of barley in Chile, R. Opazo G. (*Cartilla Practica sobre Cultivo de la Cebada en Chile. Santiago de Chile: Serv. Agron. Rejion. i Ensenañza Agr. Ambulante, 1918, pp. 33, figs. 11*).—Cultural methods and field practices employed in growing the crop are described.

The barley of Tripoli, E. De Cillis (*Agr. Colon. [Italy], 13 (1919), No. 8, pp. 259–273, figs. 3*).—Racial and cultural characteristics of Tripolitan barley are described.

Buckwheat, C. E. Leighty (*U. S. Dept. Agr., Farmers' Bul. 1062 (1919), pp. 24, figs. 6*).—This publication comprises a discussion of the soil and climatic adaptations of the crop and the field practices and cultural methods employed in its production. The utilization of buckwheat is also described.

Selection of pseudo-starchy endosperm in maize, D. F. Jones (*Genetics, 4 (1919), No. 4, pp. 364–393, pls. 8, fig. 1*).—The appearance of amylaceous seeds in an extracted recessive progeny from a cross of starchy and sweet varieties of maize is held to indicate that an imperfect segregation or contamination of the two allelomorphs may have occurred, and led to selection experiments at the Connecticut State Experiment Station in an effort to recover both parental types.

Apparently pure sweet and pure starchy strains were obtained after five generations of selection in self-fertilized lines, which remained constant during four or five additional generations of self-fertilization and selection. The sweet- and starchy-appearing selections behaved alike when crossed with ordinary starchy maize, segregating into starchy and sweet seeds in the $F_2$ in the ratio of 3:1. An examination of the starch grains of the two selections showed them to be quite similar and to lack full development as compared with starchy varieties. In chemical composition the starchy selection was found to be more like other starchy types, particularly in soluble and insoluble carbohydrates. Because of its behavior in inheritance, the nature of its starch grains, and the qualities of the seed, however, this starchy-appearing form of endosperm has

been regarded as independent and genetically distinct from true starchiness and has been termed pseudo-starchy.

Crosses of pseudo-starchy and sweet gave indistinctly segregating seed populations in the $F_2$ which showed little response to selection in the next generation, although in subsequent generations the parental patterns were recovered. The pseudo-starchy type was also recovered from the extracted sweet seeds of a cross of pseudo-starchy and true starchy. In both these crosses segregation became more distinct in later generations after the plants had been inbred. Two forms of segregation were observed, one giving a sharp mono-hybrid ratio of opaque and translucent seeds, and the other giving a less definite splitting in a 1:1 ratio, responding immediately to selection.

In interpreting the results the evidence is deemed sufficient to merit the assumption that endosperm and plant factors work together so that reciprocal crosses have slight immediate effect, and that the appearance of the seed in the $F_2$ populations is not closely correlated with their genetic composition and hence with their behavior in later generations. Tentative factorial schemes are employed to illustrate ways by which these conditions may be brought about. It is stated that no evidence was found that imperfect segregation or contamination of factors occurred in the separation of the determiners of starchy and sweet endosperms in the original cross, the effects of selection being most logically attributed to the sorting out and rearrangement of hereditary factors.

**[Cotton culture in French colonial possessions]** (*Assoc. Coton. Colon. Bul. 61 (1919), pp. 635–698, fig. 1*).—This comprises an account of the industry in French West Africa, New Caledonia, the New Hebrides, Cambodge, Tahiti, and Guadeloupe.

**Cawnpore-American cotton: An account of experiments in its improvement by pure line selection and of field trials, 1913–1917,** B. C. Burt and N. Haider (*Agr. Research Inst. Pusa Bul. 88 (1919), pp. 32, pls. 10, fig. 1*).—Selection work, tests of new importations, observations on climatic conditions from season to season, and cultural experiments with so-called Cawnpore-American cotton are described. It is stated that the American cotton compares favorably in every respect with "desi" cotton, and that under suitable marketing conditions it is much more profitable.

**Report of the Indian Cotton Committee** (*Calcutta: Govt., 1919, [vols. 1], pp. IX+264; [2] pls. 7*).—This comprises a report of the committee appointed by the Governor General to examine into the agricultural and economic phases of long staple cotton production in India.

The first part of the report deals with the cultural problems and the possibilities of extending long staple cotton production in each Province. The second part includes a discussion of commercial questions and statistics, the establishment of a central cotton trade association in Bombay, and the formation of a central cotton committee to coordinate all work with cotton throughout India. The report is supplemented by two maps of India showing the distribution of the different kinds of cotton by districts and the relative importance of the crop; by irrigation maps of the Punjab, the United Provinces, and of Sind; and by two plans of a model ginning factory.

Inheritance of certain characters in the cowpea (Vigna sinensis), S. C. Harland (*Jour. Genetics, 8 (1919), No. 2, pp. 101–132, fig. 1*).—The author describes observations on the mode of inheritance of factors affecting the flower color, the pattern of the seed coat, and the color of the seed coat pattern of *V. sinensis*, which may be summarized as follows:

The factor producing the type of flower color known as pale (almost white streaked with violet) has been designated L, and is said to exert a visible effect only in types with the Holstein and small eye patterns. It is also

thought to be the factor mentioned by Spillman (E. S. R., 30, p. 636) as the one responsible for the production of anthocyanin in the stems and leaves.

The factor D, which exerted a visible effect only in the presence of L, converted the small eye pattern into the Watson pattern and the Holstein into the solid, at the same time changing the flower color to dark (deep reddish violet). Additional factors were recognized as follows: $H_1$, a factor which converted the small eye pattern into the Holstein pattern; $H_2$, which behaved in a manner similar to $H_1$; B, a factor for black seed coat which also manifested itself in the production of a red tipped pod and a calyx and peduncle having more or less anthocyanin pigmentation; N, a factor for brown or buff color in the seed coat pattern; and M, a factor for dark maroon testa pattern.

In a cross between small eye and solid color the behavior of certain of the $F_3$ families is held to indicate that both the Holstein factors were involved. The ratio of Holstein to no Holstein in the $F_2$ was as 4.9:1, as compared with the expected ratio of 15:1. Linkage between the two Holstein factors is believed to account for the $F_2$ results but not for those of the $F_3$. It is stated that no hypothesis can be suggested at the present time which will account for both the $F_2$ and the $F_3$.

The following pairs of factors appeared to be inherited independently of each other: L and D, D and $H_1$, D and $H_2$, $H_1$ and $H_2$, and M and N.

**Henequen in Yucatan**, R. Barba (*El Henequen en Yucatan. Mexico: Sec. Agr. y Fomento, Dir. Agr., 1918, 3. ed., pp. 95+11, pls. 3*).—This comprises a rather detailed account of sisal production in Yucatan.

**A giant legume as a forage crop for Cuba**, M. Calvino (*Estac. Expt. Agron. Cuba Bol. 43 (1919), pp. 29, figs. 7*).—The production of *Meibomia leiocarpa* for forage is described.

**Production of late or main-crop potatoes**, W. Stuart (*U. S. Dept. Agr., Farmers' Bul. 1064 (1919), pp. 39, figs. 21*).—Field practices and cultural methods employed in growing the crop are described. It is stated that approximately 85 per cent of the potatoes produced in the United States are grown as a late or main crop.

**The industrial and nutritive value of the potato in Ireland**, T. Johnson and C. Boyle (*Dept. Agr. and Tech. Instr. Ireland Jour., 18 (1918), No. 4, pp. 443–471, figs. 7*).—It is stated that the size of the starch grains varies with the size of the tuber, the largest being found on the outer and the inner side of the vascular ring. Starch content is greatest in the cortex, least in the inner pith. Moisture and total nitrogen increase from cortex to inner pith. Examination of the cut surface of a tuber indicates somewhat roughly, but serviceably, the probable composition. A thick cortical layer corresponds to a high starch content; a thin layer to a large proportion of crude protein. However, the unevenness in the thickness of the layers renders it necessary to use whole tubers (rather than sections) in analysis. Very large tubers are apt to be watery and lacking in starch. Soil and climate vary the composition of the tubers. High rainfall lowers starch content.

**Rice experiments [in Trinidad], 1915–1918**, J. de Verteuil and L. A. Brunton (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 2, pp. 98–103*).—This describes the results of variety, cultural, and seed selection tests with rice.

In the variety experiments, the average yields secured during the 5-year period of 1914–1918, inclusive, ranged from 17.73 barrels (2,127.6 lbs.) of paddy per acre for A. H. C. to 20.39 barrels for Jerrahan. Observations on varieties imported from Ceylon, India, Java, Formosa, British Guiana, and Louisiana are included. Increased yields ranging from 1.91 to 6.77 bags of paddy per acre were obtained from early (February) preparation of the land over late (June) preparation. The best results were secured with a planting

distance of about 10 in., with from 2 to 4 plants per hole. A larger average number of tillers per plant and larger yields have been secured by single plant selection.

Cross-pollination of sugar cane, H. B. COWGILL (*Jour. Dept. Agr. and Labor Porto Rico, 3 (1919), No. 1, pp. 1–5*).—This paper has already been noted from another source (E. S. R., 40, p. 241).

Varieties of sugar cane in Porto Rico, F. S. EARLE (*Jour. Dept. Agr. and Labor Porto Rico, 3 (1919), No. 2, pp. 15–55*).—This paper comprises a discussion of the cultural value and characteristics of sugar cane varieties grown in Porto Rico, together with brief botanical descriptions of a number of the varieties supplemented by a key for their identification.

Breeding timothy at Svalöf, H. WITTE (*Jour. Heredity, 10 (1919), No. 7, pp. 291–299, figs. 7*).—The author presents a brief account of the methods employed in timothy breeding at Svalöf, the numerous forms studied, and the results secured. Characters which have received attention with regard to variation and heredity include the length, thickness, and direction of growth of the stem; the number and length of internodes; the size and color of leaves; the length, thickness, shape, stiffness, and compactness of head; the size and color of glumes, the color of anthers, and the form, color, and size of seed; physiological characters such as hardiness and earliness; the quantity of aftergrowth and stooling ability; and disease and drought resistance. It is said to be practically impossible to secure perfectly constant strains of timothy, and in view of this fact the work of the plant breeder is believed to consist chiefly of the elimination of characters of purely theoretical interest in an effort to obtain the highest posssible uniformity in practical characters.

Characters deemed desirable for a timothy variety which is to be employed in a two-year meadow include tall, not too stout, erect, comparatively stiff stems with short top internodes and relatively long base internodes, vigorous, abundant stooling power, profusion of leaves, perfectly fresh at cutting, rich aftergrowth, hardiness, highest possible resistance to rust, convenient earliness, and good development during the second year. A desirable variety for perennial pasture, on the other hand, is described as one possessing vigorous stooling power, early and abundant aftergrowth after each grazing, hardiness, highest possible resistance to rust, and highly increased longevity. Good seed production is regarded as equally important as a high hay yield, the following characters being deemed essential for this purpose: Tall, stiff, compact, uninterrupted heads; big, plump, well-colored seeds, easily removed from empty glumes and with well-attached floral glumes; and a high degree of self-fertilization.

In trials with selected sorts of timothy made during the period of 1909–1918 two new strains have been developed and distributed, Primus and Gloria, which have produced approximately 12 and 20 per cent more green fodder per hectare, respectively, than ordinary Swedish timothy.

Inheritance of branching habit in tobacco, J. JOHNSON (*Genetics, 4 (1919), No. 4, pp. 307–340, figs. 10*).—Studies conducted at the Wisconsin Experiment Station are described in which observations were made on the inheritance of the branching or suckering habit of tobacco in a cross between a Cuban type having numerous large suckers and a Little Dutch strain possessing a few small suckers. The conclusions are based largely on counts and weights of suckers of the parental types and of succeeding generations made over a period of years under widely varying environmental conditions, as well as upon data secured when the parents and several succeeding generations of the cross were grown the same year under identical conditions. Data are also presented on correlations between the number of leaves and the number and

weight of suckers, and on the inheritance of height of plants, number of nodes and leaves, flowering, and leaf size and shape. The results may be summarized as follows:

The branching or suckering habit of tobacco is a distinct characteristic and behaves as other inheritable characters, although subject to very considerable fluctuating variation, due to environmental conditions and to certain physiological factors. The $F_1$ generation of the cross mentioned above was intermediate between the two parents for number of suckers, but somewhat above the intermediate condition for weight of suckers, thought to be due to the stimulus of heterozygosis. The reciprocal $F_1$ generations behaved in an almost identical manner, and the variation was on the whole no more than that of the most variable parent, as shown by the standard deviation.

The $F_2$ generation possessed a range of variation as great or greater than that of the combined range of the two parents. The standard deviation from the mean as regards the suckering habit was practically twice that of the average of the parents or of the $F_1$. The large majority of the $F_2$ plants appeared to approach more nearly the Cuban type than the Little Dutch type, although the means more nearly resemble the intermediate condition found in the $F_1$.

Segregation in regard to the suckering habit was definitely shown in the $F_3$ and succeeding generations, strains having been isolated which suckered even less profusely than the Little Dutch parent, while others were almost as prolific as the Cuban type, the large majority ranging between the two extremes. The standard deviations indicated that certain of these strains were no more variable than the parents and were probably breeding true for the suckering habit, while other strains carried as far as $F_6$ have failed to show any signs of the homozygous condition. The production of few and small suckers appeared to be the recessive condition. The inheritance of the suckering habit is regarded as purely quantitative and not separable into satisfactory classes or ratios. The results are held to be comparable with those obtained by East, Hayes, and Emerson for various quantitative characters in tobacco, maize, and other plants, and it is believed the data should be interpreted in a similar way on the multiple factor hypothesis.

It is stated that random observations and systematically recorded data tend to show that no particular correlation exists between number, size, or shape of leaves and the number or size of suckers in the second generation of a cross between a large suckering and a small suckering type. While the production of a nonsuckering type of tobacco combined with the commercial practice of "topping" is regarded as probably impossible for purely physiological reasons, it is believed that by crossing and selection the production of relatively few and small suckerng strains of a certain type of leaf may be obtained. This may be of some commercial importance, although the combination of this character with the proper leaf shape and quality will be extremely difficult to obtain.

The combination and segregation of characters has also been demonstrated in this cross for such characters as height of plant, number of nodes and leaves, size and shape of leaves, and time of flowering. The occurrence of two abnormalities entirely foreign to the parents, one a morphological monstrosity and the other a "physiological weakness," are recorded as illustrating the occurrence of "new" characters in a variety cross under controlled conditions.

**Flue-cured tobacco in Canada**, D. D. Digges and H. A. Freeman (*Canada Expt. Farms Bul. 38, 2. ser. (1919), pp. 44, figs. 7*).—This publication comprises a general discussion of the production, harvesting, curing, and handling of flue-cured tobacco in Ontario by D. D. Digges (pp. 9–30), together with

observations on tobacco soils, rotations, and fertilizers (pp. 31–40) and on cooperative fertilizer tests (pp. 41–44) by H. A. Freeman.

Mechanical analyses are presented of 44 soils and subsoils now producing flue-cured tobacco in Canada, and the conclusion reached that the best soil for this type of tobacco is a loose, porous sand from 6 to 10 in. deep, underlaid by a sand to sandy loam subsoil with good natural drainage. Chemical analyses of a few of these soils are included and indicate a rather low state of fertility. Tests with commercial fertilizers are said to have given good results. The use of a complete fertilizer containing sulphate of potash, acid phosphate, and sulphate of ammonia or dried blood is recommended. The maintenance of fertility and the best conditions for growth are believed to be dependent upon a proper system of crop rotation. Turning under a clover crop just preceding planting to tobacco resulted in an inferior yield of poor quality. Observations on the proportion of stalk to leaf secured in Canada showed an average of 55.2 to 44.8. It is thought that a larger proportion of leaf could be secured, together with an improvement in quality, through earlier and lower topping.

**The 1919 yields from ten wheat fields in "Egypt,"** C. G. HOPKINS ET AL. (*Illinois Sta. Circ. 236 (1919), folio*).—This circular reports the wheat harvest from 10 different experimental fields on which crop rotation systems and fertilizer experiments are being conducted.

**[The cultivation of the greater yam (Dioscorea alata)],** I. H. BURKILL (*Gardens' Bul. Straits Settlements, 2 (1919), No. 4, pp. 129–135*).—This comprises a progress report on cultural tests with *D. alata* conducted at the Singapore botanic gardens during 1918. See also a previous note (E. S. R., 40, p. 637).

**The longevity of Bacillus radicicola on legume seeds,** C. R. FELLERS (*Soil Sci., 7 (1919), No. 3, pp. 217–232*).—Bacteriological and vegetation experiments conducted at the New Jersey Experiment Stations are described in which an effort was made to ascertain the viability of *B. radicicola* on soy bean and alfalfa seed subjected to varying conditions of inoculation and held in storage for different lengths of time.

Evidence is presented to show that such seed inoculated with nodule infusion retained viable nodule-forming organisms on the seed coat for from six to nine months, while plants grown from these seeds possessed nodules on their roots. The soy bean and alfalfa organisms appeared to withstand about the same degree of desiccation. The shortest period of time (five minutes) that the seeds were kept in contact with the inoculant gave nearly as good results as longer periods. The use of gum tragacanth did not aid materially in prolonging the vitality of the bacteria, and the use of this material or similar substances is deemed inadvisable. Infected dry soil dusted upon moist seeds gave better results than sterile dry soil dusted upon moist inoculated seeds. Soil inoculation did not prove to be any more effective than inoculation with nodule infusion or commercial cultures. Commercial cultures gave as good results as nodule infusion.

In general the number of bacteria per seed and the number of nodules per plant were not closely correlated, it being apparent that only a few of the cells present on a seed were capable of nodule production. It is stated that this ratio may be as 1:1,000,000. It is also deemed probable that those organisms which resist desiccation longest possess the greatest infectibility. The greatest destruction of cells occurred within the first few hours after inoculation, after which they perished relatively more slowly and uniformly.

The inoculation of soil in pots with a rich nodule infusion increased considerably the number of nodules produced per plant over that produced by inoculated seed alone.

While it is not recommended that inoculated seeds be stored for long periods of time before planting, a delay of several days or a month is believed to do no harm. There appeared to be little difference in the resistance to desiccation whether nodule infusion, commercial cultures, or soil is employed as the infecting agent.

**Farm weeds of North Carolina and methods for their control, II,** J. L. Burgess and C. H. Waldron (*Bul. N. C. Dept. Agr., 40 (1919), No. 8, pp. 53, figs. 25*).—In a further contribution to the subject (E. S. R., 38, p. 141), the authors describe and illustrate 25 important weeds found in the State, together with information relative to their eradication and control.

## HORTICULTURE.

**The aerial fertilization of plants with carbon dioxid,** M. B. Cummings and C. H. Jones (*Vermont Sta. Bul. 211 (1918), pp. 3–56, pls. 4*).—A detailed account is given of experiments conducted to determine the general behavior of greenhouse plants aerially supplied with carbon dioxid in excess of that normally contained in the air. The trials were begun in 1909 and continued for seven years. Widely dissimilar types of plants were chosen, beans and peas representing the legumes; radishes and potatoes the root and tuber crops; lettuce, Swiss chard, and endive the foliage plants of the salad class; the strawberry of the fruit crops; and nasturtium and cyclamen of the flowering plants. The work for the earlier years consisted in learning methods of procedure. The data presented are based upon results secured from 1911 on. It was found impossible to supply an excess of carbon dioxid in closed receptacles which did not subject the plants to abnormal conditions of humidity and ventilation. Hence open cases were employed in all of the trials. The carbon dioxid was generated continuously, liberated slowly, and allowed to bathe the plants by dispersion. The results of the several trials are presented in tabular form and discussed. Earlier investigations along similar lines are briefly cited.

The early effect of an extra carbon dioxid dosage on beans was to stimulate the growth of the seedlings, thus producing larger plants. The later effect was to enhance the production of pods and beans and slightly to change the chemical composition of the plant by proportionally increasing the carbohydrate storage. Peas were similarly benefited. Roots responded less favorably than did most of the plants used in these trials. The results, however, were positive in all instances. Weight increments were distributed in roots and stems, but chiefly the former were affected. Treated roots and plants grew faster than the untreated ones, became edible sooner, and exhibited larger carbohydrate and smaller protein contents.

Potatoes, as a rule, grew more leaflets and more, heavier, and better tubers when dosed with carbon dioxid. Tuber formation did not begin earlier, but proceeded faster when once started. In one-fifth of the trials the untreated plants weighed less than did the treated ones. Swiss chard and endive responded to gas treatment by producing larger and heavier foliage and by maturing earlier. The trials with lettuce were less conclusive, but in a majority of instances the treatment seemed beneficial. The foliage of strawberry plants was more abundant and heavier, and the total weight and number of fruits far in excess of the production of untreated plants. Cyclamens either yielded more flowers or showed gains in weight of corms when extra carbon dioxid was furnished. Treated nasturtiums gained consistently when

compared with untreated plants. The flowers blossomed earlier, were produced in greater profusion, and the total weight of the plants as well as the number and weight of the leaves were increased.

Summing up the results of the experiments, as a whole, excessive carbon dioxid dosage stimulates plant growth and consequently increases production, both of total crop weight and of food nutrients. Carbon dioxid appears to function much as does a commercial fertilizer and to be, to a greater or less extent, a limiting factor in plant growth. Plants can use advantageously more than normally occurs in the air. The chemical composition of plant life is slightly, though not materially, changed by the stimulation of carbon dioxid. The treated plants almost without exception show higher carbohydrate and lower protein contents than do those grown under normal conditions. The differences seldom exceed two or three per cent and are often less.

The optimum amount of carbon dioxid for use in open boxes where dispersion is continuous appears to be determined in the main by the plant which is under trial. Five tests were made with beans and nine with lettuce, the gaseous dosage varying in amounts from nil to 348 liters. Lettuce seemed to stand and profit by a daily bath in nearly 300 liters of carbon dioxid. The trials with beans were noted and classified, but the results indicate that the optimum is somewhat lower than for lettuce. Continuity of supply seems to be quite as important as its gross amount.

**Is cooperative marketing of horticultural products applicable to Illinois conditions?** J. W. Lloyd (*Illinois Sta. Circ. 238 (1919), pp. 7*).—A revision of a paper presented before the Illinois State Horticultural Society on December 19, 1917, in which the author concludes that fruits and vegetables grown in Illinois for distant markets can be successfully marketed through cooperative organizations of the growers.

**Some economic aspects of fruit and vegetable storage,** J. W. Lloyd (*Illinois Sta. Circ. 237 (1919), pp. 8*).—A revision of an address delivered before the Illinois State Horticultural Society on November 21, 1918, in which the author discusses the importance of storage, location of storage houses, size of towns that should store apples, storage for local consumption in producing regions, types of storage structures for apples, construction of an outdoor cellar, and storage of potatoes and root crops.

**Olneya beans,** O. F. Cook (*Jour. Heredity, 10 (1919), No. 7, pp. 321–331, figs. 5*).—The author gives an account of *Olneya tesota*, a leguminous tree of the southwestern desert region, and calls special attention to the possibilities of making practical food use of the natural supply of beans produced by these trees.

**Studies on the biology and culture of superior mushrooms,** G. Boyer (*Mém. Soc. Sci. Phys. et Nat. Bordeaux, 7. ser., 2 (1918), pp. 233–344, pls. 4, figs. 20*).—Part 1 of this work comprises a general exposition of germination and cultural experiments with various species of superior mushrooms. Part 2 contains an account of the author's work with morels, notably *Morchella esculenta*, and investigations on the genus Psalliota. The results of cultural experiments with various other mushrooms studied are also given. The more important mushrooms are considered, with reference to germination of the spores and early development of the mycelium, mycelium in its relation with its active or inert substrata, relation of the sporiferous apparatus with its mycelium and reciprocally, the development and method of growth of the mushrooms, methods of culture, fertilizing and manuring, decay and disappearance of mushrooms, and analytic composition. An extensive bibliography on mushrooms is appended.

**Report of plant industry**, P. A. GLENN (*Ann. Rpt. Dept. Agr. Ill., 1 (1918), pp. 15–22*).—A report of nursery inspection work within the State for the year ended June 30, 1918.

**Some important problems in pomology and their significance**, H. P. GOULD (*Ohio State Hort. Soc. Ann. Rpt., 52 (1919), pp. 20–28*).—Among the problems discussed by the author are the maintenance of soil fertility, the selection of a management system adapted to the individual orchard, pruning, the improvement of fruits through bud selection, and the development of American-grown fruit stocks.

**Fruit blossoming records**, H. B. TERRY (*So. African Fruit Grower and Smallhold., 6 (1919), No. 9, pp. 243, 245, 247*).—A contribution from the Potchefstroom Agricultural Experiment Station, comprising a variety list of orchard fruits with dates of first and full bloom.

**Fruit and fruit products of South Africa**, R. A. DAVIS (*So. African Jour. Indus., 2 (1919), No. 8, pp. 774–783*).—This paper deals with the present status of the deciduous fruit industry in South Africa.

**[Lists of fruits and ornamentals recommended for planting in Wisconsin]** (*Ann. Rpt. Wis. State Hort. Soc., 49 (1919), pp. 7–17*).—Lists are given of orchard and small fruits, ornamental trees, shrubs, and perennial plants recommended for planting in Wisconsin, including also a list of shrubs all of which have been tested and found not sufficiently hardy for general planting.

**The cost of building an orchard**, V. H. DAVIS (*Ohio State Hort. Soc. Ann. Rpt., 50 (1917), pp. 108–114, fig. 1*).—The author purchased a 145-acre farm and commenced to convert it into an orchard property in 1906. Annual cost data are given for all operations the first ten years, during which time 95 acres were planted to orchard and 25 acres were ready to be planted.

At the end of the 10-year period, the total expenditures were $43,705.99, and the total sales $9,592.29. An invoice was made at the end of this period, in which the total investment was figured at $39,800, which after adding the total expense leaves a balance of $5,686.30, the balance being dependent upon the value given the trees.

**The outgo and income of a 10-acre apple orchard**, U. P. HEDRICK (*Ohio State Hort. Soc. Ann. Rpt., 51 (1918), pp. 23–28*).—A summarized statement of data presented in New York State Station Bulletin 376 (E. S. R., 31, p. 46).

**Some notes on the distance between trees in planting at the experiment station orchard**, W. J. GREEN (*Ohio State Hort. Soc. Ann. Rpt., 51 (1918), pp. 20–23*).—In the spring of 1893 the variety apple orchard at the Ohio Experiment Station was planted, the trees being set 35 ft. apart each way. The author presents measurements taken January 15, 1918, showing the spread of branches for 31 varieties, and calls attention to the evils of overcrowding trees in an apple orchard.

Of the varieties listed, all but two had a spread of over 30 ft. in diameter, and 16 had a spread ranging from 35 to 40 ft.

**Apple bud selection: Apple seedlings from selected trees**, C. S. CRANDALL (*Illinois Sta. Bul. 211, abs. (1918), pp. 4*).—An abstract of Bulletin 211 of the station (E. S. R., 39, p. 844).

**Apple grading laws.—Their value and requirements**, H. C. HETZEL (*Ohio State Hort. Soc. Ann. Rpt., 51 (1918), pp. 66–70, fig. 1*).—A report on investigations conducted by the Bureau of Markets, U. S. Department of Agriculture, relative to the present status of apple-grading laws and practices in different States, with conclusions as to the value and requirements of apple-grading laws.

The author concluded that properly enforced State laws were of much importance to the apple industry, and that a National law establishing one standard for all sections seemed highly desirable and practicable.

**Controlling important fungus and insect enemies of the pear in the humid sections of the Pacific Northwest**, D. F. FISHER and E. J. NEWCOMER (*U. S. Dept. Agr., Farmers' Bul. 1056 (1919), pp. 34, figs. 18*).—This describes the more important fungus and insect enemies of the pear in the region mentioned, and gives directions for combating them. It also tells how to prepare the spray materials needed and how to apply them. A spraying schedule, showing concisely when and with what to spray, is included.

**Pruning experiments**, F. S. CHAMBERS (*Proc. Amer. Cranberry Growers' Assoc., 48 (1918), pp. 3–7, fig. 1*).—An account is given of pruning experiments conducted with the Early Black cranberry at Whitesbog, N. J.

In December, 1915, six plats were pruned in different ways and six left as check plats. Heavy pruning produced a shorter and more satisfactory vine growth, slightly reduced the crop in 1916, but greatly increased it the following season. The greatest improvement in both vines and crop was produced by removing nearly all of the runners and leaving a good stand of uprights. The excessive pruning of vines resulted in only slight improvement. Pruning also apparently reduced the percentage of injury by frost and by fungus diseases.

**Spoilage of cranberries after picking**, C. L. SHEAR (*Wis. State Cranberry Growers' Assoc. [Proc.], 31 (1918), pp. 27–30*).—In this paper the author briefly calls attention to the results of studies conducted by the U. S. Department of Agriculture in cooperation with the Massachusetts Experiment Station, dealing particularly with the spoilage of cranberries by fungus rots or premature death of the fruit caused by rapid ripening or suffocation. It is pointed out that in order to lessen the amount of spoilage from these causes the cranberries should be cooled as quickly as possible after picking, stored in a cool, well-ventilated place, and handled carefully to avoid bruising. Ventilated packages should be used, especially for early shipments.

**The reduction of cranberry losses between field and consumer**, C. L. SHEAR, N. E. STEVENS, and R. B. WILCOX (*Proc. Amer. Cranberry Growers' Assoc., 48 (1918), pp. 7–10*).—A contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, in which the authors briefly consider the various operations to which cranberries are subjected in marketing them and the evidences of injury from bruising as shown by the keeping quality of the fruit.

**"Reversion" and resistance to "big bud" in black currants**, A. H. LEES (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1918, pp. 25–28*).—A summary of a study noted from another source (E. S. R., 41, p. 241).

**Raspberry growing on small holdings**, J. M. HODGE (*Jour. Bd. Agr. [London], 26 (1919), No. 4, pp. 396–410, pls. 2*).—An account of two colonies of raspberry growers established in Scotland several years ago, with special reference to the financial results attained by the average small holder in the colonies.

**Report on the activity of the viticulture station at Auvernier for the year 1917–18**, C. GODET (*Ann. Agr. Suisse, 20 (1919), No. 23, pp. 1–55, figs. 6*).—In addition to a report on routine operations, data are given on pruning, training, and intercropping experiments, as well as experiments in the control of mildew and Cochylis. Must analyses made at the station, together with analyses of the station wines, are also included.

**Native fruits of North Dakota**, L. R. WALDRON (*Minn. Hort., 47 (1919), No. 11, pp. 426–435, figs. 3*).—The author calls attention to the practical importance for North Dakota of such fruits as the buffalo-berry, sand cherry, Missouri currant, and other wild fruits.

**Applying the furrow manure in citrus groves**, A. D. Shamel (*Cal. Citrogr., 5 (1919), No. 1, p. 4, figs. 4*).—Some additional notes on methods of applying manures in furrows (E. S. R., 38, p. 845).

**Report on the yield of coffee trees in the Surinam cultural garden during the year 1918, with comparative data for previous years**, E. Van Drent (*Dept. Landb. Suriname Verslag. 1918, pp. 51–86*).—Yield data are given for several lots of trees of different varieties of coffee that were grown from selected trees. In many cases records are given for the four years, 1915–18.

**Olive growing and oil pressing**, A. Orazo G. (*Cartilla Práctica sobre el Cultivo del Olivo i Elaboracion del Aceite. Santiago de Chile: Serv. Agron. Rejion. i Enseñanze Agr. Ambulante, 1918, pp. 63, figs. 28*).—Practical instructions on olive culture and the manufacture of olive oil, with special reference to conditions in Chile.

**Manual of practical olive culture**, G. Vitetta (*Manuale di Olivicoltura Practica. Casale Monferrato, Italy: Marescalchi Bros., [1914], pp. XVI+260, figs. 14*).—The introductory part of this manual deals with the history and importance of olive culture, climatic and soil requirements, varieties, and the selection of varieties for starting new groves. The succeeding parts deal with the propagation of olives, planting, cultural details, insect pests, and diseases and their control.

**The palms of the Philippine Islands**, O. Beccari (*Philippine Jour. Sci., 14 (1919), No. 3, pp. 295–362, pls. 3*).—A descriptive account of the Philippine species of palms, including a conspectus of species of each genera.

**A pineapple fertilizer experiment**, P. Gonzáles (*Jour. Dept. Agr. and Labor Porto Rico, 3 (1919), No. 1, pp. 6–13, pls. 2*).—A preliminary report on an experiment started by H. B. Cowgill at the Porto Rico Insular Experiment Station.

The experiment as here outlined consists of a trial of complete fertilizers of different compositions. The yield records for the first season are presented, and the results thus far secured indicate that nitrogen exerts the greatest influence on production, followed by potash. Heavy applications of acid phosphate appear to be injurious. Generally speaking, fertilizers have increased the yield as compared with no fertilizers, and there is some evidence in favor of organic as compared with inorganic fertilizers.

**First report on fruit culture as practiced round about Tharushah (Sind) in Nawabshah District**, M. U. F. Barakzai (*Dept. Agr. Bombay Bul. 88 (1918), pp. 18*).—This comprises notes on native methods of propagating and growing the mango, orange, and ber or jujube (*Ziziphus jujuba*), including suggestions for improvement in cultural methods.

**A variety nut orchard** (*Missouri Bot. Gard. Bul., 7 (1919), No. 8, pp. 129–132*).—A descriptive list is given of varieties of pecans, black walnuts, Persian walnuts, and hickory nuts included in the nut orchard at the Missouri Botanical Garden, St. Louis.

**[Note on the condition of trees at the Hettinger substation, 1918]**, U. J. Downey (*North Dakota Sta. Bul. 130 (1919), p. 56*).—Brief notes on the condition of shelter belts and ornamental and fruit trees growing at the substation in 1918 are given.

**Commercial drug growing in the United States in 1918**, W. W. Stockberger (*Jour. Amer. Pharm. Assoc., 8 (1919), No. 10, pp. 807–811*).—A paper on this subject read before the scientific section of the American Pharmaceutical Association in November, 1919, in which the present cultural status in the United States of some of the more important drug plants is considered.

## FORESTRY.

**Report of the director of forestry for the year 1918**, R. H. CAMPBELL ET AL. (*Dept. Int. Canada, Rpt. Dir. Forestry, 1918, pp. 70, figs. 13*).—A report on the activities of the forestry branch of the Canadian Department of the Interior for the year 1917–18, with reference to forest protection, tree planting, operations of the forest reserves, forest surveys, and investigational work. Appended to this report are reports of the chief of the tree planting division, the superintendent of the forest products laboratories of Canada, and inspectors of the forest reserves for Manitoba, Saskatchewan, Alberta, and British Columbia.

**The forests of British Columbia**, H. N. WHITFORD and R. D. CRAIG (*Ottawa: Comm. Conserv. Canada, 1918, pp. VIII+409, pls. 49*).—A report on a survey of the forest resources of British Columbia, conducted under the direction of the Commission of Conservation of Canada. Part 1 discusses geographical relations, physiographic relations, climatic and soil relations, land tenure in British Columbia, forest administration on provincial lands, forest administration on Dominion lands, forest policy, forest exploitation, forest trees in British Columbia, and insect injuries to forests in British Columbia. Part 2 contains summarized data on the forest resources of British Columbia as a whole and detailed data on the forest resources of the several interior regions and the coastal belt of the Province. The text is accompanied by numerous illustrations and maps. Appended to the report are the timber-sale contract, volume tables for Douglas fir, cedar, and hemlock, and the British Columbia log scale.

**Reafforestation and the economic development of France**, P. DESCOMBES (*Mém. Soc. Sci. Phys. et Nat. Bordeaux, 7. ser., 2 (1918), pp. 103–217, pl. 1, figs. 2*).—A memoir on previous reafforestation policies in France, with a plea for a much broader development of both national and private reafforestation.

In part 1 the author discusses the denudation and decadence of the mountain regions, the overgrazing of pastures, and the genesis of the laws on the reafforestation of mountains. Part 2 deals with the forests of the plains, the forestry situation at the beginning of the nineteenth century, and the large public reafforestation projects undertaken during the nineteenth century.

Previous to the world war, the author concludes, France did not produce half of the construction wood needed for home consumption. He points out the importance of reafforestation to the economic development of the country, and suggests remedies with the view of stimulating private, as well as national, silviculture.

**A forest policy for Australia**, C. E. LANE-POOLE (*Sci. and Indus. [Aust.], 1 (1919), Nos. 2, pp. 87–93, figs. 6; 3, pp. 152–161, figs. 10*).—The author sketches the conditions that have brought about a serious forestry situation in Australia, recommends the adoption of a uniform forest policy for the whole country, and considers the essential features of such a policy.

**Effect of changed conditions upon forestry**, W. W. ASHE (*Jour. Forestry, 17 (1919), No. 6, pp. 657–662*).—The author points out that in view of the increase in stumpage value of low-grade timber in the Appalachians clean cutting is no longer necessary to secure an ample margin of profit. Low-grade trees may be reserved for price appreciation, small trees for accretion, and trees of the choicest species for seed trees. The motor truck and the portable band-mill have been used with sufficient success to indicate that, with a good system of roads, cuttings may be made over the same tract at frequent intervals without materially added cost. The conduct of investigations in serial fellings on private lands with auto trucks as motive power is advocated.

**The development of a brush-disposal policy for the yellow-pine forests of the Southwest.** H. H. CHAPMAN (*Jour. Forestry, 17 (1919), No. 6, pp. 693–702*).—The author enumerates the factors that should be given consideration in formulating a practical brush-disposal policy, reviews previous brush-disposal practices employed, and presents the standard instructions for brush disposal on the National Forests of New Mexico and Arizona for yellow pine and Douglas fir types, except on Coconino and Tusayan forests. The article also includes Comments on Brush Disposal in the Southwestern District, by G. A. Pearson.

**Making best use of idle lands in New York.** J. W. STEPHEN (*N. Y. State Col. Forestry, Syracuse Univ., Circ. 19 (1919), pp. 53, figs. 18*).—This circular contains concise information on the starting and care of woodlands.

**What is potential forest land?** C. HOAR (*Jour. Forestry, 17 (1919), No. 6, pp. 650–656*).—The author tentatively defines potential forest land as "land suitable for the growth of tree species in stands . . . under natural conditions or such artificial conditions as are economically practicable." The policy pursued in eliminating lands from and adding lands to the National Forests is discussed, and more thorough investigation of various factors influencing land classification is advocated, with the view of securing definite knowledge relative to potential forest land.

**The segregation of farm from forest land.** P. S. LOVEJOY (*Jour. Forestry, 17 (1919), No. 6, pp. 627–646*).—The author attributes the failure to secure the development of a rational forest policy for the lands now waste and idle largely to the assumption that there is an inherent conflict between the forest and farm. He discusses the fallibility of this assumption, points out the importance of forestry to farming, critically reviews present methods of land classification, and advocates a comprehensive survey for separating forest from farm land that shall embrace topographic, geologic, geographic, agronomic, forest, and economic work.

**New Indian species of forest importance.** B. L. GUPTA (*Indian Forester, 45 (1919), No. 7, pp. 388–392*).—A list is given of 48 new Indian species of forest importance, showing their distribution.

**Indian species of Carissa.** H. H. HAINES (*Indian Forester, 45 (1919), No. 7, pp. 375–388, pls. 4*).—Descriptive notes with a key are given of the Indian species of Carissa, which yield Karaunda bark and Karaunda leaves, important sources of tannin.

**Cultivation and tapping of Castilla rubber in the Philippines.** V. C. ALDABA (*Philippine Agr., 7 (1919), No. 9–10, pp. 274–307*).—A contribution from the Philippine Experiment Station, comprising a study of the Castilla rubber industry in the Philippines, and based both on the author's practical experience and on available literature.

Consideration is given to the history, botany, and geographic distribution of Castilla, methods of culture, factors determining methods of culture, local method of culture, pests and diseases, seed bearing habit, light requirement and growth, variation in yield, improvement by selection, relation of planting distance to yield, tapping operations, and equipment. The text is accompanied by growth and yield data based upon measurements and tapping experiments conducted in local plantations, and the author presents conclusions relative to the best method of growing and tapping Castilla trees.

**The distribution of walnut.** W. H. LAMB (*Hardwood Rec., 47 (1919), No. 2, pp. 21, 22*).—The great demand for American black walnut wood created by the war has caused special attention to be focused on this cabinet wood, and has led to many attempts to bring in substitutes which frequently have little merit because character and physical properties are lacking or because the

available supply is limited. The author presents a complete analyses of species which might be brought in from foreign sources to be sold as, or with, black walnut.

**Instructions for the planting and care of conifer trees in cooperative shelter belts** (*U. S. Dept. Agr., Bur. Plant Indus., 1919, pp. 3*).—The instructions herein given are applicable to the semi-arid regions of the West.

**Mechanical aids in stem analysis**, E. C. PEGG (*Jour. Forestry, 17 (1919), No. 6, pp. 682–685*).—The author presents suggestions for lessening the labor connected with stem analysis, especially office computations. The suggestions are based on experience in cordwood and tie operations in the Ozark region of Southern Missouri.

**Mensuration in France**, D. BRUCE (*Jour. Forestry, 17 (1919), No. 6, pp. 686–690*).—Observations on forest mensuration practices in France.

**Pathological marking rules for Idaho and Montana**, J. R. WEIR and E. E. HUBERT (*Jour. Forestry, 17 (1919), No. 6, pp. 666–681*).—The paper presents the urgent need of forest sanitation in most of the timber sales conducted in Idaho and Montana, with special reference to the white-pine type of forest. An attempt is made to formulate marking rules which are intended to cover the removal of all infected trees upon the area which, if left, would act as a menace to the remaining or future stands. Special attention is drawn to the removal of infected trees below and above the specified diameter limits. The practical application of such rules to the various forest types of the region is discussed, together with methods and means of enforcing them. A bibliography of literature dealing with forest pathology is appended.

**[Fire protection in Maine in 1918]** (*Dept. State Lands and Forestry [Maine] Bul. 2 (1918), pp. 5–45*).—A report for 1918 on forest fires and fire protective measures for the year, both in the Maine forestry district and in other parts of the State not included in this district.

**Report of the chief forest fire warden for the year 1918**, G. H. WIRT (*Penn. Dept. Forestry Bul. 19 (1918), pp. 74, pls. 7*).—A statement of the work of the Bureau of Forest Protection, including data on forest fires in Pennsylvania during 1918 with comparative data for the two previous years.

**Forest fires in Canada, 1917** (*Dept. Int. Canada, Forestry Branch Bul. 68 (1919), pp. 24, figs. 12*).—A statistical report on the extent and causes of forest fires in the various Provinces in Canada in 1917.

**Observations on some effects of fires in the chir (Pinus longifolia) forests of the West Almora Division**, H. G. CHAMPION (*Indian Forester, 45 (1919), No. 7, pp. 353–364, pl. 1*).—The author presents observations on the effects of former and recent forest fires on stands of chir trees and other forest vegetation.

**Pulp and paper, 1917** (*Canada Census Indus., 1917, pt. 4, Sect. 4, pp. 52+XI*).—A statistical report on the pulp and paper industry in Canada for the calendar year 1917.

## DISEASES OF PLANTS.

**The mode of dissemination of fungus and bacterial diseases of plants**, M. W. GARDNER (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 359–423*).—The bibliography appended to this discussion contains 220 titles.

**[The unreliability of certain appearances in diagnosis of plant diseases]**, F. W. NEGER (*Centbl. Bakt. [etc.], 2. Abt., 48 (1918), No. 5–9, pp. 178–181*).—Examination of cases cited leads to the conclusion that in some plant diseases, abnormal phenomena, though they may be prominent, are in many cases unreliable as diagnostic features. They may not be directly related to the cause of

the trouble, and in some cases are no more than post mortem phenomena, in the production of which such agencies as light may have been the main factors.

**Michigan plant disease survey for 1917**, G. H. Coons (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 425–450, pls. 10*).—An account of Michigan plant diseases in their relations during 1917 is prefaced by the statement that the data are not yet at hand for the consideration of the fungi in the State in any manner comparable to what can be done in regard to the distribution of the higher forms. Only gross similarities can be pointed out.

It would seem that in large part the climate determines the fungus flora. Of the two factors, temperature and rainfall, the former seems to be operative in a broad way and the latter in a local way, influencing the annual prevalence. The plant diseases of Michigan are practically those of the other States of the same latitude.

**Plant diseases [British Guiana]**, C. K. Bancroft (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1917, pp. 50, 51*).—Leaf disease of Para rubber (*Melanopsammopsis ulei*) was not so prevalent as during the previous year. Where the winter condition of the trees occurs generally over the whole of the plantation at the same time, few of the trees showed the disease, which thus appears unable to endure the period of rest, requiring for survival a continuous supply of green trees. Indigenous rubber trees (*Hevea confusa*) in some parts furnish a basis for continual infection.

Bud rot of coconut still prevails in certain districts. Both mango and breadfruit are subject to ripe rot, which may be avoided by spraying with Bordeaux mixture just after the fruit sets and then again three or four weeks later. Witches' broom of cacao has declined during the past two years, yielding readily to Bordeaux mixture if the brooms are also removed. The rice plant so far appears resistant to disease. With the exception of smut (*Tilletia horrida*), the other known diseases of rice in the colony are blast (*Piricularia oryzæ*) and stem rot (*Sclerotium oryzæ*), which are present in negligible quantity. The most prevalent and only important disease of sugar cane is that due to *Marasmius sacchari*, which affects the roots. The only two citrus diseases of consequence are collar rot and citrus knot.

**Investigations on diseases of plants and their treatment**, O. Grove (*Jour. Bath and West and South. Counties Soc., 5. ser., 12 (1917–18), pp. 124–142, fig. 1*).—A fruit blossom bacillus, affecting particularly blossoms and fruit spurs of pear trees, has been shown to be carried by insects. The organism has also been shown to be fairly common in the soil not earlier than April. It was found and studied in connection with roots of cabbage and other plants.

Damping-off and collar rot of tomatoes differ only in the stage at which the attack occurs. The fungus appears to be Phytophthora. The original source of infection is not known, though sterilization of infected soil prevents the disease.

Good results were obtained from the 1917 experiments on control of Rhizoctonia disease of asparagus. In studies of reversion of black currants the primary cause was found to be the interference of mites with normal terminal growth.

The work with Burgundy mixture so treated as to develop copper stearate appears to be the same as that described elsewhere by A. H. Lees (E. S. R., 40, p. 746).

**Philippine economic-plant diseases**, O. A. Reinking (*Philippine Jour. Sci., Sect. A, 13 (1918), Nos. 4, pp. 165–216, figs. 20; 5, pp. 217–274, pls. 22, figs. 23*).—This compact account of Philippine plant diseases of economic importance takes up the hosts alphabetically, discussing the diseases and naming causal organisms where known.

Fungus diseases are said to be found on practically all cultivated and wild plants in the Laguna Provinces, and they are thought to be numerous in other agricultural regions in the Islands. The great factors in the spread and destructiveness of fungi are lack of proper culture, of sanitation, of pruning, and of spraying, of which none is practically carried on in the Islands. While the list of diseases is by no means complete, many are due to fungus species supposedly new to science.

Notes are given on means and measures recommended for control of certain diseases.

**Porto Rican fungi, old and new**, F. L. Stevens (*Trans. Ill. Acad. Sci., 10 (1917), pp. 162–218, figs. 13*).—This is a detailed and somewhat systematic account of numerous fungi in Porto Rico, some of the species being regarded as new and some being apparently of economic interest.

**Some new Porto Rican fungi**, L. E. Miles (*Trans. Ill. Acad. Sci., 10 (1917), pp. 249–255, figs. 3*).—The species herein noted as collected in 1912–13, and since that time determined by persons named, are listed in connection with the hosts in relation with which they live as saprophytes or parasites, some of the fungi being possibly of economic importance.

**The rusts of the Douglas Lake region**, L. Bonar (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 277, 278*).—A list of 40 rusts with their hosts is given as collected in the summer of 1917 within 4 or 5 miles of the University of Michigan Biological Station.

**Notes on Cephaleuros virescens**, R. Higley (*Trans. Ill. Acad. Sci., 10 (1917), pp. 256–258*).—This paper deals with gross details of *C. virescens*, which appears on 10 different hosts. Superficial characters make it possible, it is said, to divide the species into four distinct groups. The differences observed are supposed to be due to the resisting power of the several hosts.

**Physiological characters as a means of distinguishing between the species of Penicillium**, W. Wöltje (*Centbl. Bakt. [etc.], 2. Abt., 48 (1918), No. 5–9, pp. 97–130, figs. 5*).—This is a detailed account of study, with tabulation, of several species of Penicillium as regards physiological reaction to media of different characters, both physical and chemical.

**Lime-sulphur sprays**, V. Vermorel and E. Dantony (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 40 (1919), No. 7, pp. 152–154*).—In view of the multiplicity of formulas for preparing lime-sulphur and the inconstancy and inconsistency of their effects, and in particular of the injury sometimes resulting from their use, experimentation has recently been carried out by the authors. The results are briefly detailed as regards substances found to exist in the solution or in the sediments in relation to temperature, time, proportion, dilution, surface exposure, and impurities.

**Stem rust of grains and the barberry in Wisconsin**, A. G. Johnson and J. G. Dickson (*Wisconsin Sta. Bul. 304 (1919), pp. 16, figs. 15*).—A popular description is given of the various rusts which occur on cereals, special attention being given to the black stem rust of wheat and the relation of the common barberry to its spread.

**Take-all, the wheat growers' worst enemy**, J. T. Pridham (*Agr. Gaz. N. S. Wales, 30 (1919), No. 2, pp. 77–79*).—Observations during some years, and systematic counts made recently of wheat plants affected in each of several varieties named, show a serious degree of infection of wheat at the Cowra and other farms conducted by the Government. The results are serious in the aggregate, whether the disease be due to *Ophiobolus herpotrichus*, *Cladosporium herbarum*, *Fusarium rubiginosum*, or *Mucor racemosus*, or to a combination of these. Tabulated figures for a considerable number of wheat varieties show in each case the number of days required for the wheat to mature and the per-

centage of plants affected with take-all; also of those showing the presence of bunt, loose smut, and flag smut.

**Phyllachora as the cause of a disease of corn, and a general consideration of the genus Phyllachora**, N. E. DALBEY (*Trans. Ill. Acad. Sci., 10 (1917), pp. 230–248, pl. 1, figs. 5*).—An injurious disease of corn, supposedly not recorded previously for Porto Rico (where nearly every field examined showed infected leaves) is described as studied in connection with herbarium material collected in 1915 by Stevens.

A fungus, apparently *Scolecotrichum graminis*, was commonly present in discolorations somewhat similar to those which are associated with the disease in question. This fungus has been identified by the author as *P. graminis*.

**Studies on tracheomycoses: Verticilliose of cucumber**, H. A. A. VAN DER LEK (*Meded. Landbouwhoogsch. [Wageningen], 15 (1918), No. 1, pp. 1–58, pls. 6*).—This is a detailed account of the wilting disease of cucumber claimed to be due to *Verticillium alboatrum*.

**Frost injury of potato tubers**, J. E. KOTILA (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 451–460, pls. 2*).—Experimentation is described as made for the purpose of determining the conditions for the various spottings and internal discolorations of potato tubers, also for determining the effects of chilling and freezing on germinability. Two methods for chilling and freezing tubers were tested, and are described.

The results as tabulated are considered to show that it is possible to reproduce various types of injury under controlled conditions. The necrosis type of injury developed in tubers chilled from 3 to 4 hours at —13 to —17° C. if the tubers were afterwards kept at room temperature for five days. The darkening type of injury was produced in tubers kept with others for 24 hours at —5 to —17°. Tubers kept for 5 hours or more at —13 to —17° do not show so marked a discoloration as do those kept for 3 to 4 hours at the same temperature. No discoloration occurs in case of severe chilling or freezing. This fact is attributed to the more complete killing of the cells and to the bacterial activity. Chilling accelerates the action of tyrosinase, and also retards germination of tubers, sprouts being killed after exposure to —13 to —17° for 4 hours.

**Unknown corpuscles in diseased spinach roots**, T. A. C. SCHOLVERS (*Meded. Landbouwhoogsch. [Wageningen], 15 (1918), No. 2, pp. 75–84, pl. 1*).—A disease on spinach roots is noted as invariably associated with the presence of intracellular bodies containing fat globules. These bodies, which appear at least in some cases to be motile, are thought to belong to the protozoa, and have been called, provisionally, X-organisms.

**Sugar-cane varieties and froghopper blight in Trinidad**, C. B. WILLIAMS (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 2, pp. 70–83*).—Based on field observations, published records, and replies to circulars sent to planters in 1912 and again in 1918, the susceptibility of a number of varieties of sugar cane to so-called froghopper blight is briefly indicated. It is stated that no variety of cane at present grown in Trinidad is immune to the disease, but that Uba and Badilla are the most resistant sorts, while a few recent introductions are deemed worthy of more extended trial.

**The leaf mold of tomatoes caused by Cladosporium fulvum**, W. K. MAKEMSON (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 309–350, pls. 13, figs. 2*).—The causation of the tomato leaf mold by *C. fulvum* has been shown by isolation, pure culture inoculation, and reisolation. Infection occurs by way of the stomata. Blooms are especially susceptible. The mycelium is found both within and between the cells. Conidia arise from a stroma-like formation

extending through the stoma. Moisture favors growth. The approximate temperature conditions for growth are found to be, minimum 9°, optimum 20 to 25°, and maximum below 34° C. (93.2° F.) Strong, diffuse light is detrimental to spore and color formation. The organism withstands a considerable range of reaction. Translocation of starch is hindered in the infected leaves. The organism may be disseminated by air currents. While field inoculations succeed under normal conditions in the North, these do not appear to favor greatly the spread of the disease. The inoculation period requires usually 6 to 10 days, or longer under conditions of low humidity or temperature. The overwintering of the fungus is probably due to the longevity of the conidia, although growth as a saprophyte may also be a factor.

Bordeaux mixture is inefficient for control of leaf mold, as are also ammoniacal copper carbonate, potassium sulphid and sulphur dust. Commercial lime sulphur appears to be more effective as regards prevention of plant infection than self-boiled lime sulphur, but less effective in moist chamber experiments. Formaldehyde gas, while apparently effective in preventing spore germination, is expensive, owing to the quantity required. Fumigation with sulphur, as tested experimentally, appears to be an adequate means of killing spores of *C. fulvum* on trash and leaves.

**The occurrence of Alternaria in a characteristic apple spot, and an apple rot caused by Gliocladium viride,** F. J. MacInnes (*Trans. Ill. Acad. Sci., 10 (1917), pp. 218–223*).—The progress of a disease attacking immature apples sent from Harristown, Ill., for study is here noted and described, with an account of the fungi found in this connection. One of these shows no marked disagreement morphologically with *A. tenuis*. Two other species of Alternaria were found, one causing a core rot and one growing on the surface of the seed, but apparently causing no injury. *A. fasciculata*, regarded as a variety of *A. tenuis*, causes a spot not unlike the one affecting the fruit under investigation. It is not certain, however, that the trouble is due to an Alternaria.

**An apple rot caused by Gliocladium viride,** F. J. MacInnes (*Trans. Ill. Acad. Sci., 10 (1917), pp. 223–229, pls. 2, figs. 30*).—A fungus found on petri dishes in which cultures had been made while isolating fungi from diseased apples produced, when inoculated on healthy fruit, a dry brown rot. A study was made of the organism, which may prove to belong near or within *G. viride*, though some differences are noted.

**The longevity in the soil of the Sclerotinia causing the brown rot of stone fruits,** J. B. Pollock (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 279, 280*).—Facts are cited which are thought to show that Sclerotinia on mummied plums may persist in sclerotial form capable of producing ascocarps for at least 10 years, but that they can not persist indefinitely.

**The control of brown rot of plums and plum pocket,** E. C. Stakman and A. G. Tolaas (*Minn. Hort., 46 (1918), No. 5, pp. 182–186, figs. 4*).—Brown rot is said to have been reduced in experiments during recent years at the Minnesota Experiment Station from 35 per cent on unsprayed to 5 per cent on sprayed trees. Plum pocket has been reduced but not completely controlled. For either disease, Bordeaux mixture 3:4:50 or a commercial lime-sulphur 1:40 should be used at least three times (in connection with powdered lead arsenate) every year regardless of the appearance of the disease.

**Sap acidity and disease resistance in grape varieties,** M. D. Atti (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 14 (1916–17), pp. 24*).—The author concludes his account of a study on grape varieties differing as regards locality of origin with the statement that a close relation may be demonstrated between sap acidity and resistance to disease.

**Recent studies on the treatment of grape downy mildew**, L. Ravaz (*Prog. Agr. et Vitic. [Ed. l'Est-Centre), 40 (1919), No. 2, pp. 25–32*).—Damage due to grape downy mildew during the year is said to have been comparatively slight. An account of the weather is given in this connection.

For a given percentage of copper, Burgundy mixture has the same fungicidal efficacy, whether mildly acid, mildly alkaline, or neutral. The scorching effect on the leaves caused by Burgundy mixture at 1 to 10 per cent, as here tabulated, shows a somewhat uniform increase of injury with strength. The effects due to causticity differ according to state or age of the foliage, earliness of the treatment, and concentration. The preparation, composition, and behavior of several mixtures intended to be fungicidal are described.

**Treatment of downy mildew**, A. Mazotta (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 40 (1919), No. 3, pp. 54–56*).—In this article, which is said to have been translated from another source, it is stated that good results were obtained in tests with a treatment consisting of a commercial mixture consisting chiefly of sulphur and copper sulphate in different given proportions.

**The action of polysulphid on Oïdium**, J. Caputs (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 39 (1918), No. 47, pp. 491, 492*).—Employment of alkaline polysulphids at 0.5 per cent strength and an equal proportion of soap, both dissolved in water, gave satisfactory results as regards grape Oïdium. Favorable results from the use of this preparation in comparison with those from an insecticidal preparation are also noted. An account is given of the employment, as far back as 1853, of alkaline polysulphids against grape Oïdium.

**Recent views regarding arricciamento (roncet) in grapevines**, L. Petri (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 27 (1918), II, No. 9–10, pp. 271–275, fig. 1*).—Previous work (E. S. R., 28, p. 749; 29, p. 349; 31, p. 245) has been followed by this account of later study and observation regarding any causal influence of soil and climate in relation to grape roncet. The facts discussed are considered to show that roncet is probably due to the presence of a living organism.

**Distribution of Fusarium cubense, the cause of banana wilt**, E. W. Brandes (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 271–275*).—The author sketches the history of banana wilt or Panama disease in various banana producing countries of America. It is claimed that this disease is due to *F. cubense*, of which the author has furnished previously an amplified technical description (E. S. R., 38, p. 757).

A study of susceptibility to this disease brings out the fact that in any particular country this disease attacks most severely, and sometimes exclusively, the variety most widely planted. This is said to be true in mixed plantings. Varieties which are not attacked, or which are slightly attacked in a given locality, may in some other locality suffer severely from banana wilt. The facts cited suggest biological specialization on the part of the organism.

The parasite enters the plant from the soil, failure resulting from all attempts by the author to inoculate portions above ground. The disease is also carried in the propagating rhizomes and in the water in the form of spores. Sterilization, though a problem of considerable difficulty, is claimed to be possible.

Banana wilt increases excessively within a month or so after the beginning, and increases to the end of the rainy period after which plants which are slightly attacked may improve and produce fruit.

**Notes on the general treatment of fungus diseases**, A. C. Tunstall (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 4 (1918), pp. 122–128*).—The information and advice contained herein are concerned chiefly with tea culture.

**The Fusarium wilt of China aster**, W. S. Beach (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), pp. 282–308, pls. 4, figs. 13*).—This is an account of the early history of the wilt disease of China aster and of studies thereon by the author. The causal organism is claimed to be a new variety of *F. conglutinans*, and is accordingly named *F. conglutinans callistephi*.

Growth and production of conida cease at 14°C. (57.2°F.). Spores are killed by exposure to 54.3° for about 10 minutes. The fungus is thought to be disseminated in seed or else in soils.

Control measures suggested are largely prophylactic and sanitary, but include also the development of resistant strains.

**[Injury to coniferous forest trees near manufacturing plants] in the valley of the Arve**, L. Mangin (*Jour. Agr. Prat., n. ser., 32 (1919), Nos. 6, pp. 109–111, figs. 3; 7, pp. 127–129, figs. 2*).—An account is given of injury, primarily to foliage and affecting particularly conifers, some species severely, in the valley of the Arve following the increase, during the recent war, of activity in the manufacture of certain war materials.

Apparently, injury due to gas emanations from the works was brought about by their being carried after absorption into water droplets in the air during damp weather, and not by absorption of the gases directly. Root injury was noted in connection with *Trametes radiciperda*. Physiological causes of undetermined characters appear to be concerned in case of trees aged 20 to 25 years. Other investigations are considered necessary.

**Tests with some chemicals against root nematodes, II**, T. A. C. Schoevers (*Meded. Landbouwhoogsch. [Wageningen], 15 (1918), No. 2, pp. 85–88*).—The author reports a continuation of studies (E. S. R., 38, p. 555) regarding the control of nematodes by soil treatment.

It is stated that in the pots of soil kept over winter from the previous year's experiment the nematodes had disappeared by spring, supposedly having been killed by the severe cold.

A new supply was obtained and these were employed in tests with 150 tomato plants put into infected soil, each of the 10 lots containing 15 plants and receiving treatment, except one kept as control. The degree of infection (reduced to percentage) ranged from zero for the lime-ammonium sulphate mixture and the formalin treatment up through naphthalin 14, carbolineum 22, quassia 33, sulphuric acid 39, caustic potash 45, benzine 48, and potassium sulphate 51 per cent, the control showing 52 per cent of infection.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

**The raptorial birds of Iowa**, B. H. Bailey (*Iowa Geol. Survey Bul. 6 (1918), pp. 238, figs. 93*).—This report deals with the birds of prey occurring in Iowa, of which 33 forms are recognized. References to the literature accompany the account of each form.

**Notes on North American birds, IX**, H. C. Oberholser (*Auk, 36 (1919), No. 4, pp. 556–559*).

**Notes on the races of Quiscalus quiscalus**, H. C. Oberholser (*Auk, 36 (1919), No. 4, pp. 549–555*).

**The status of Larus hyperboreus barrovianus**, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), pp. 173–175*).

[Contributions on economic insects] (*Ztschr. Angew. Ent., 3 (1916), No. 1, pp. 196, pls. 6, figs. 46*).—The papers here presented include the following:

The Development of the Sexes of the Honeybee (*Apis mellifica*), by E. Zander (pp. 1–74), which deals with (1) the postembryonal development of the reproductive organs, (2) of the drone, (3) of the queen, by F. Löschel, (4) of

the worker, by K. Meier, and (5) with general concluding considerations, including bibliographies of 51, 5, 10, 6, and 35 titles, respectively; The Pine Spinning Sawfly (*Lyda hypotrophica*) in Roggenburg Forest, by Parst (pp. 75–96); Contribution on the Biology and Anatomy of the Pine Spinning Sawfly (*L. hypotrophica=Cephaleia abietis*), by F. Scheidter (pp. 97–116); A Contribution on the Fly Problem, by A. Hase (pp. 117–123); The Biological Control of the Mulberry or West Indian Peach Scale (*Diaspis pentagona*), by J. Boile (pp. 124–126); Fertilizing and Insect Attack, by L. Reh (pp. 127–133); Maybeetle Control in Bienwald (Rhine Province): A Model Example of Technical Insect Control, by K. Escherich (pp. 134–156); The Pteromalid Genus Platyterma of Walker (1834) and a New Species [*P. eckstcini*] reared by C. Eckstein in Germany from *Lophyrus pini*, by M. Wolff (pp. 157–171); The Control of Wood-boring Beetles (Anobium) in an Old Carving, by J. Bolle (pp. 172–178); *Hylemyia coarctata*, by R. Kleine (p. 179); and Notes on the Introduction of Sericulture into Germany Based upon a Personal Knowledge of the Biology of the Silkworm, by O. Maas (pp. 180–194).

**Some plagues of our cultivated crops,** R. Arango (*Sec. Agr. Com. y Trab., Comision Sanid. Veg. Cuba, Bul. 2 (1919), pp. 94, pl. 1, figs. 43*).—A descriptive account of some of the more important insect pests and diseases of cultivated crops in Cuba, including directions for their control.

**Contribution on the Javanese mole crickets,** W. Roepke (*Treubia [Dutch East Indies], 1 (1919), No. 2, pp. 90–97, fig. 1*).—The author reports upon investigations of the mole crickets occurring in Java which represent two species, namely, *Gryllotalpa hirsuta* and *G. africana*.

**[Thysanoptera of Florida], IV–V,** J. R. Watson (*Fla. Buggist, 2 (1918), No. 3, pp. 97–102; 2 (1919), No. 4, pp. 116–119; 3 (1919), No. 1, pp. 2–5*).—This continuation of the paper previously noted (E. S. R., 40, p. 353) lists additional species, making a total of 59. Six species are described as new and the genus Megalomerothrips is erected. Keys to the genera of Phlœothripidæ and to species of Trichothrips, Haplothrips (Anthrothrips of Uzel), and Frankliniella are included.

**Hemiptera collected by the Yale Dominican expedition of 1913,** E. H. Gibson (*Proc. U. S. Natl. Mus., 55 (1919), pp. 275–277*).

**Notes on Gargaphia tiliæ, the linden lace bug,** H. B. Weiss (*Proc. Biol. Soc. Wash., 32 (1919), pp. 165–168*).—This is a report of observations made during the summers of 1918 and 1919 at Uhlerstown, Pa., where the linden lace bug was fairly abundant on lindens.

Eggs which are inserted in the lower leaf surface in clusters of from 60 or less to 300 hatch in about a week, and the combined nymphal stages require about three weeks, making a month from egg to adult. Adults of the first brood appear during the last of June and first of July, while the adults of the second generation hibernate and appear the following spring. Five nymphal stages are described.

**Hyalopeplus smaragdinus n. sp., a new tea capsid in Java,** W. Roepke (*Treubia [Dutch East Indies], 1 (1919), No. 2, pp. 73–81, figs. 7*).—The species here described was taken from a tea plantation in the vicinity of Soekaboemi, Java. Notes on the life history of the species are included.

**The potato leaf hopper and the hopperburn that it causes,** E. D. Ball (*Wis. Dept. Agr. Bul. 23 (1919), pp. 76–102, figs. 25*).—This is a detailed report of an investigation of *Empoasca mali* by the author, a brief preliminary account of which has been noted from another source (E. S. R., 40, p. 353).

The first report of the injury in Wisconsin, where serious loss resulted in 1917, is said to have been received just before the middle of July. Some of the worst fields were alreaiy dried up and dead, while others were so severely

injured as to have stopped growing. In some places beans adjoining the potato fields had already been damaged. Within a week reports of injury to potatoes by the leaf-hoppers had been received from practically all parts of the State and later from other States, including Montana, North Dakota, South Dakota, Minnesota, Michigan, and New York.

"The first sign of trouble is usually a triangular brown area at the tip of the leaf running back on the midrib. This is quickly followed by a progressive burning of the margin, usually from the tip backwards but occasionally in more or less triangular spots appearing along the margin, each one of these centered in a lateral veinlet. These increase in area and the burnt margin increases in width until nothing but a narrow strip along the midrib remains green, and in serious cases this weakens and dies and the leaf shrivels up."

Proof that the attack of the potato leaf-hopper (*E. mali*) is responsible for producing hopperburn condition was obtained through cage experiments. It was found that dahlias are attacked in the same way and with the same effect produced on potatoes, its injury being quite serious in a number of localities. It has been found commonly on water sprouts and rapidly growing tips of box elder trees, and has been known to attack fast-growing shoots of apple stock in the nursery and rapid growing raspberry canes. This type of burning is not produced by any other known leaf-hopper or other insect, and this leaf hopper has not been found seriously injuring any plant in which the burning does not occur.

"To summarize the evidence then, it appears that leaf-hopper outbreaks have been followed in every case by hopperburn epidemics; that these outbreaks have occurred with little reference to temperature or moisture conditions; that the distribution of burning in the field and upon vaieties has been entirely with reference to time of planting and the flights of the leaf-hopper, rather than to varieties or characteristic soil or moisture conditions; that no case of this type of burning has appeared in which the evidence of the leaf-hopper work was not present, and no leaf-hopper attack has been known without subsequent burning; that this insect produced this distinct and different type of injury on other plants; and finally, that in controlled experiments the injury has been reduced or prevented at will."

Studies indicate that most of the variation in susceptibility to attack by different varieties of potatoes was due to difference in the time that these plants developed sufficient foliage to furnish a place for egg deposition for the spring brood of adults. Observations indicate that a single leaf-hopper may seriously injure or even entirely destroy the margin of a leaf during its growing period.

The author has studied the effect of the grape leaf-hopper on grapes and woodbine, the rose leaf-hopper on roses and apple, and *E. unicolor* on apple (which he points out should be known as the apple leaf-hopper), and finds that these produce a similar injury, a characteristic white spotting which appears more markedly on the upper surface of the leaf, although the punctures are made from below. A comparison of box elder leaves attacked by the grape leaf-hopper with those attacked by the potato leaf-hopper affords a striking difference in the effect produced. It is thought possible that the difference in the method of feeding may account for the difference in effect, the grape leaf-hopper and the apple leaf-hopper (*E. unicolor*) puncturing the membranes of the leaf, while the potato leaf-hopper more commonly attacks the veins. The author considers it more probable that the affection is due to "some specific transmitted by the insect." The cage experiments showed that where two or three were present on each leaf it took only a few days to de-

stroy a plant. In considering its biology the author compares that of the potato leaf-hopper with *Typhlocyba rosæ* and *E. unicolor*.

Its natural enemies include an undetermined dryinid which parasitizes the egg, and a fungus (*Entomophthora sphærosperma*) which destroys large numbers. As regards control measures the author recommends the application of blackleaf 40 at the rate of 1 part to 800 parts of water to which 5 parts of soap have been added. Since the nymphs feed entirely on the under surface of the leaves the spray nozzles should be set to direct the stream upward. The applications should be made as soon as the first burning appears on the leaves, that is, late in June or early in July. Arsenicals for the control of the Colorado potato beetle may be added to the mixture, or the whole, omitting the soap, may be added to Bordeaux. Where kerosene emulsion is used it should be as strong as safety to the foliage permits, 7 or 8 per cent of kerosene or 1 part of the stock emulsion in 8 parts of water having been found satisfactory.

An illustration is given of a drag board attachment which bends the plants, thus exposing the under surface of the leaves to the spray. A bibliography of 39 titles is appended.

**The potato leaf hopper and its relation to the hopperburn**, E. D. Ball (*Jour. Econ. Ent., 12 (1919), No. 2, pp. 149–155, pl. 1, fig. 1*).—A more detailed account is given in the paper above noted.

**Report of a second collection of Nova Scotian eupterygid leaf hoppers, including descriptions of new varieties**, W. L. McAtee (*Canad. Ent., 51 (1919), No. 10, pp. 225, 226*).

**A study of the plant lice injuring the foliage and fruit of the apple**, R. Matheson (*New York Cornell Sta. Mem. 24 (1919), pp. 683–762, pls. 23, figs. 10*).—This is a report of studies at Ithaca, N. Y., of the life history and bionomics of the three species of plant lice that are frequently very injurious to the foliage and fruit of the apple, namely, the apple aphis (*Aphis pomi*), referred to by the author as the green apple aphis (pp. 686–718); the rosy apple aphis (*A. sorbi*) (pp. 718–750); and the European grain aphis ([*Siphocoryne*] *Aphis avenæ*) referred to as the grain, oat, or apple-bud aphis (*A. avenæ*) (pp. 750–758).

The apple aphis is the most common and widespread of the three, doing considerable injury every year, not only in bearing orchards but also in young orchards recently set and in nurseries. The greater amount of injury caused by this species is due to its remaining on the apple tree throughout the season, whereas the rosy apple aphis and the European grain aphis migrate in May, June, and early July to other host plants. In recent years the rosy apple aphis has also become very injurious and now does as much if not more damage in bearing orchards than does the apple aphis. The author concludes that all three species, now common on apple in all parts of the United States and Canada, are of European origin, having reached the United States in the first half of the nineteenth century. The failure to distinguish between the three species has led to much confusion in the literature even to the present day and this, as is pointed out by the author, is all the more noticeable since the three species differ so markedly in their life histories and the character of their injury to the foliage.

A somewhat detailed account of *A. pomi* was given in his memoirs by DeGeer who did not confuse it with the other two, but this account appears to have been overlooked until very recent years. The species was first clearly distinguished in this country by Pergande in 1904 (E. S. R., 16, p. 71), and a concise account of its life history was first presented by Smith in 1900 (E. S. R., 12, p. 268) under the name *A. mali*. Important accounts of its biology have been published by Brittain (E. S. R., 35, p. 853) and by Baker and Turner

(E. S. R., 34, p. 754). The food plants recorded by the author are apple, pear, American crab apple, mountain ash, hawthorn, and quince. Some varieties of apples are more susceptible than others, the author having found Twenty Ounce, Maiden Blush, King, Fall Pippin, Greening, and Baldwin to be the most susceptible to injury.

Investigations of the rosy apple aphis based upon rearings at Ithaca, N. Y., during the seasons of 1914, 1915, and 1916 are reported, with references to recent publications on the species by Brittain (E. S. R., 35, p. 853) and Baker and Turner (E. S. R., 36, p. 356). The author supports the view of Sanderson, who in 1901–2 (E. S. R., 14, p. 268; 15, p. 593) identified the American form as *A. sorbi* of Kaltenbach, thus differing with Baker and Turner who consider it to be a distinct form described by Fitch as *A. malifoliæ*. The fact that this species did not assume the status of an important apple pest in the United States until late in the nineteenth century is shown to be due to the fact that it must have an abundance of its summer host plants, the introduced European narrow-leaved and broad-leaved plantains (*Plantago lanceolato* and *P. major*), near at hand. The first real work on its bionomics was reported by Sanderson in 1901–2. More recent work has been reported by Britton in 1910, Brittain in 1915, and Baker and Turner in 1916.

Rearing experiments and field observations by the author show that *P. lanceolata* is the preferred summer host plant, and at Ithaca at least it is essential to the continued reproduction of the species during the summer. Breeding experiments on *P. major* were never successful for more than two or three generations, the line dying out sometimes very quickly, which results agree with those obtained by Baker and Turner, although Ross in 1915 and Brittain report very successful breeding experiments on *P. major*. The author points out that there is a remarkable parallelism between the spread of *P. lanceolata* and the spread and increase in destructiveness of *A. sorbi*.

The author's studies of the European grain aphis relate only to it upon the apple, its primary host. Studies of it on other hosts have been made by a number of writers, including those of Davis (E. S. R., 31, p. 753). At Ithaca only three generations are normally produced on the apple, and the winged migrants have practically all left by early June for summer host plants, which include a large number of grasses and cultivated grains. At Ithaca the fall migrants begin to appear on apple and hawthorn about the last week in September.

Data relating to the reproduction of *A. pomi* and *A. sorbi* are presented in detail in tabular form, and charts are given showing the reproductive capacity of the generations for 13 generations of *A. pomi* and 10 of *A. sorbi*. Illustrations in colors are given of the first instar of the stem mother, of the mature stem mother, the winged viviparous female, mature oviparous female, mature male, spring migrant, returned migrant, and mature oviparous female. The effect of the three species upon the apple tree and its fruit is pointed out.

A bibliography of 54 titles is appended.

Recent studies of the eggs of the three species by Peterson at the New Jersey Stations have been noted (E. S. R., 41, p. 253).

Miscellaneous aphid notes, I, J. J. Davis (*Canad. Ent., 51 (1919), No. 10, pp. 228–234, figs. 6*).—The genus Heteroneura is erected for *Aphis setariæ*, and two species are described as new, namely, *A. cuscutæ* and *Macrosiphum ribicollum*. *A. cuscutæ* was collected at Kaysville, Utah, on dodder (*Cuscuta epithymum*) growing on alfalfa.

Fitch's thorn leaf aphis, A. C. Baker (*Proc. Biol. Soc. Wash., 32 (1919), pp. 185, 186*).—The author finds that *Aphis cratægefoliæ* of Fitch belongs to the

genus Anuraphis. *Aphis brevis* of Sanderson represents the same species and therefore becomes a synonym.

**Trench fever**, R. P. STRONG ET AL. (*London: Henry Frowde and Hodder & Stoughton, 1918. pp. VIII+446, pls. 12, figs. 146*).—A detailed report of the Commission Medical Research Committee, American Red Cross, of which a preliminary report has been previously noted (E. S. R., 39, p. 658).

Included in this report are the details of two groups of transmission experiments with *Pediculus humanus* (pp. 143–274). The authors' conclusions are that *P. humanus corporis* is capable of transmitting trench fever, not only when it passes directly from an infected man to a new host but also even to a third man, to whom it may be transferred two days later. The relative frequency of positive results in these experiments, which closely simulated natural conditions, indicates that this louse is an important agent in the spread of trench fever in France. It does not appear to transmit the infective quality to its offspring through the egg. "Lice were certainly rendered infective in 9.5 days and probably in 6 to 7 days by feeding them on a trench-fever patient from the latter part of the first to the seventh days of illness, inclusive, and then on a healthy man for about three days. . . . There is evidence that, if the virus undergoes development in the louse, it requires 6 to 10 days to do so; there is a little evidence that suggests the minimum incubation period to be about four days. Lice may remain infected for at least 10 days and possibly 13.

"Lice may transmit trench fever under conditions in which the injection of the saliva appears to be a more prominent feature than the presence of a few minute granules of louse feces in the vicinity of the bitten areas during the feeding process. The incubation period of the disease produced under the conditions cited in [one case] was more protracted than in some of the other transmission experiments; after exposure twice a day for 21 days one man developed the disease in 27 days and the other in 38 days from the time of first being bitten.

"The exact rôle of the mouthparts in transmitting the virus is still undetermined. In four experiments, in which infective louse feces were rubbed into scarifications, the average period of incubation of the disease was 9 days, ranging between 7 and 10 days. From two experiments it would appear that the blood of recovered cases is not infective 100 days after onset of the disease."

**Mosquitoes in relation to yellow fever**, H. NOGUCHI (*Jour. Expt. Med., 30 (1919), No. 4, pp. 401–410*).—The experiments here reported show that symptoms and lesions closely resembling those of yellow fever in man can be induced in guinea pigs by the bite of female stegomyias ([*Stegomyia*] *Aedes calopus*) that have previously sucked the blood of a yellow fever patient or of an animal experimentally infected with *Leptospira icteroides*.

"With mosquitoes infected directly from a yellow fever patient the infectivity seems to become manifest after a longer period of incubation than with those infected with the animal blood. In the former, at least 12 days are said to be necessary before they become infectious, and this hypothesis seems to be borne out by the present experiment. On the other hand, the mosquitoes which were engorged with the infected blood of the guinea pig were found to be capable of transmitting the disease within 8 days after the feeding. This discrepancy may be explained by the fact that the number of leptospira existing in experimentally infected guinea pigs is far greater than that in human blood. The frequency with which positive transmission by the stegomyia was obtained in both instances was very small, indeed, in view of the number of mosquitoes employed. . . .

"Whether or not *L. icteroides* can survive and multiply only in the body of *S. calopus* and not in other varieties or genera is yet to be determined.

"Another interesting fact with regard to the extrinsic life of this organism is that it can multiply steadily at a temperature from 18 to 37° C. [64.4 to 98.6 F.] The optimum temperature at which it remains viable for many months is 26°. The climate in most of the tropical countries offers optimum conditions both for *L. icteroides* and for the mosquito, which carries and nourishes it."

**Notes on Allograpta fracta (Diptera: Syrphidæ),** W. M. DAVIDSON (*Canad. Ent., 51 (1919), No. 10, pp. 235–239, fig. 1*).—These notes relate to the habits of a predaceous syrphus fly observed in the Imperial Valley in California in the spring and early summer of 1918.

The larvæ were specially beneficial to barley from March 15 to April 30, at which date most of the grain had ripened, and to corn during May and June. In fields in which they were specially abundant 25 per cent of the infested heads had larvæ working on the aphids. Experiments showed that a larva could, during its lifetime, eat all the aphids on from three to four heads of grain of average infestation. In one field of 20 acres, examined on a number of occasions, it appeared that *A. fracta* was responsible for an almost total destruction of barley aphids.

Larvæ of *Eupodes volucris*, *Syrphus americanus*, *A. obliqua*, and *Catabomba pyrastri* were present in the barley and corn fields, but in much smaller numbers than those of *A. fracta*.

In the Los Angeles district of southern California, *A obliqua* is very abundant and *A. fracta* comparatively scarce, whereas in the Imperial Valley the reverse holds true. In 1918 *A. fracta* was not reared from any other host than *Aphis maidis*, except that a single larva was taken attacking *A. pseudobrassicæ*.

**A contribution to the knowledge of Brazilian Œstridæ,** A. LUTZ (*Mem. Inst. Oswaldo Cruz, 10 (1918), No. 2, Trans., pp. 118–137*).—A translation of the paper previously noted (E. S. R., 40, p. 458).

**The prevention of blow-fly attacks on sheep by spraying,** A. H. E. MCDONALD (*Agr. Gaz. N. S. Wales, 30 (1919), No. 6, pp. 403–405, figs. 3*).—This is a brief statement of tests of dips, consisting of sheep-dip powder, a carbolic liquid dip, and a mixture containing arsenate of soda. While treated sheep were not absolutely protected from attacks by the sprays, the percentage of affected sheep was only 33 per cent against 54 per cent in the untreated group.

**Experiments for the control of the grape root-worm,** F. Z. HARTZELL (*New York State Sta. Bul. 453 (1918), pp. 257–332, pls. 10, figs. 8*).—This bulletin gives a brief account of the life history, habits, and economic importance of *Fidia viticida* (pp. 261–269) followed by a detailed account of control experiments conducted over a period of six seasons, much of which data is presented in tabular form.

The experiments have led the author to recommend two methods of control: (1) The application of molasses 2 gal., arsenate of lead 6 lbs., and water 100 gal., followed in about one week with an application of Bordeaux mixture (8:8:100) and arsenate of lead 6 lbs.; (2) two applications of Bordeaux mixture (8:8:100) and arsenate of lead 6 lbs., at an interval of about 10 days. The first system of treatment is specially recommended when the beetles are present in excessive numbers, while the second is advised for general vineyard spraying when beetles are not abundant. "The addition of molasses destroys the adhesiveness of the arsenate of lead [E. S. R., 38, p. 858], thus necessitating the precaution of applying the material at a time when the weather conditions indicate that no rain is to be expected for several days. A supplementary treatment should be made in about one week with Bordeaux mixture and poison to protect vines from invading beetles. Two gal. of molasses in each 100 gal. of spray produced better results than 1 gal."

Two sprayings with Bordeaux mixture and arsenate of lead, thoroughly

applied at the proper time, have given effective control. The effectiveness of the spraying is more pronounced when the treatment is continued over several seasons. Failures to combat the beetle satisfactorily are largely attributed to delay in making the applications, allowing too long an interval between the first and second applications, and lack of thoroughness due to poor spraying apparatus, dense foliage, or spraying in windy weather.

Investigations relating to this pest by Johnson and Hämmar (E. S. R., 24, p. 165) and others have been previously noted.

**Life history of the orchid pest (Crioceris subpolita Motsch?)**, S. Leefmans (*Treubia [Dutch East Indies], 1 (1919), No. 2, pp. 82–89, pls. 3, figs. 5*).—This paper relates to a species which was received from several localities, Padang (Sumatra), Buitenzorg, and Tjilatjap (Java), and was reared at Padang. Both the beetles and larvæ are destructive to various kinds of orchids by eating the flowers by preference and also the fruits and leaves if there are no flowers. The complete life cycle covers a period of from 25 to 31 days.

**The quince curculio (Conotrachelus cratægi).—Methods of control in western New York**, L. F. Strickland and J. B. Achilles (*N. Y. Dept. Farms and Markets, Dir. Agr. Bul. 116 (1919), pp. 45, pls. 8, figs. 3*).—Requests for assistance in eradicating the quince curculio in Niagara County, N. Y., the leading county in quince production in the eastern United States and where for many years it has not been uncommon for 80 to 90 per cent of the crop to be seriously injured by this pest, led to the studies here reported. Following a brief account of the life history of the species the details are reported of control experiments conducted in the years 1915, 1916, 1917, and 1918, respectively, a large part of which is given in tabular form.

Very satisfactory results were obtained from two applications in July of Bordeaux (3:3:50) or lime-sulphur (1:40), to which was added 3 lbs. of arsenate of lead to 50 gal. of spray. The first application was made as the adults began to feed, which varies from July 6 to 17, and the second about 5 days later, when oviposition took place. The spray should be so applied that both the upper and under surfaces of the fruit and foliage are covered. The spraying should be supplemented by the collection and removal of all drops and culls from the orchard before the larvæ have left the fruit for hibernation.

"The results of applying the spray at the two periods were excellent, the time the spray was applied being very important. The curculio larvæ in plat 1 were reduced from 69.16 per cent to 1.78 in 1915, 0.89 in 1916, 6.32 in 1917, and 0.32 in 1918. In plat 2 from the same infestation the curculio larvæ were reduced to 21.48, 0.95, 0.59, and 0.06 per cent in the same four years. In plat 3 from the original infestation the larvæ were reduced to 21.48 per cent in 1915, 0.18 in 1916, 0.04 in 1917, and to none in 1918. On the check trees the percentage of infestation of curculio larvæ was 69.16, 78.25, 69.23, and 2.77 from 1915 to 1918 inclusive, the small infestation of 1918 being credited to the unfavorable weather conditions at the time the larvæ left the fruit in October, 1917."

A list is given of nine references to the literature.

**The life history of some social wasps in Java**, W. Roepke (*Treubia [Dutch East Indies], 1 (1919), Nos. 1, pp. 46–50, pl. 1; 2, pp. 61–67, pls. 2, fig. 1*).—In the first paper the author deals with *Polistes diabolicus*, and in the second with *P. javanicus*.

**Studies on the biology of Paracopidosomopsis, I–IV**, J. T. Patterson (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 32 (1917), No. 5, pp. 291–305; 33 (1917), Nos. 1, pp. 38–50, pls. 2; 2, pp. 57–66, pls. 2; 35 (1918), No. 6, pp. 362–376, pls. 3*).—This is a report largely of studies conducted at Austin, Tex., the first part of

which consists of data on the sexes. The second, by the author and L. T. Porter, relates to spermatogenesis of males reared from unfertilized eggs; the third considers maturation and fertilization; and the fourth deals with the asexual larvæ.

The species used in the study was *Paracopidosomopsis floridanus* of Ashmead, which oviposits in the egg of the cabbage looper. Its egg develops in the body of the cabbage looper caterpillar, and by the time the caterpillar reaches the stage for pupation the larval parasites have consumed its entire contents and pupate within the skin of the host, which later hardens to form the mummified carcass. This form is said to be similar to the European chalcidid *Litomastix truncatellus* studied by Silvestri (E. S. R., 19, p. 57).

The author's studies indicate clearly that a fertilized female is capable of laying eggs from which individuals of both sexes develop, and that the unfertilized egg produces males only.

References to the literature are included in the first two papers.

Reference is made by the author to his previous observations on the development of *Copidosomo gelechiae*.[1]

## FOODS—HUMAN NUTRITION.

**Nutrition in war and lessons to be learned from it,** F. Rho (*Ann. Ig. [Rome], 29 (1919), No. 5, pp. 269–276*).—The author discusses the effect of a restricted diet in different countries during the war, emphasizing the fact that the decided reduction in calories and protein has not been productive of as much trouble as was to be expected. In conclusion he recommends that an effort be made to adopt a standard ration somewhere between the 2,000 calories and 70 gm. of protein of the war rations and the 3,500 calories and high protein of prewar times.

**The practicability of feeding a scientifically balanced ration in Army camps,** R. J. Anderson (*Amer. Jour. Physiol., 49 (1919), No. 4, pp. 523–530*).—The author discusses certain important problems connected with the proper feeding of an army, and suggests the advisability of having an officer trained in the science of nutrition in every camp or division or of maintaining a separate department of nutrition or alimentation in connection with the War Department, with subordinate officers in the camps. The practicability is also suggested of having a uniform menu for a whole camp instead of separate menus for the different messes.

**Average food consumption in the training camps of the United States Army,** J. R. Murlin and F. M. Hildebrandt (*Amer. Jour. Physiol., 49 (1919), No. 4, pp. 531–556, figs. 11*).—Statistical data on the food consumption in the training camps of the United States Army during the recent war, based on nutritional surveys made in 67 different camps including a total of 427 individual messes, are presented in the form of tables and graphs, and discussed under the headings of total consumption, food consumption by organizations, the effect of season on food consumption, the effect of length of time in camp, food consumption in the canteen, food consumption in the Army compared with other occupations, distribution of nutrients in the Army diet, percentage of calories supplied by chief components of the ration, and variety. An earlier report on the same subject has been previously noted from another source (E. S. R., 40, p. 68.)

Variations in strength and in the consumption of food by recruits and seasoned troops, P. E. Howe, C. C. Mason, and S. C. Dinsmore (*Amer. Jour.*

[1] Biol. Bul. Mar. Biol. Lab. Woods Hole, 29 (1915), pp. 333–373.

*Physiol., 49 (1919), No. 4, pp. 557–566*).—Determinations are reported of the variations in strength and weight of approximately 40 men from each of 8 companies of recruits during 3 successive weeks. The food consumption during the same period was also determined. Most of the companies had been in camp only a few days and during the first 2 weeks of study were inoculated and vaccinated. The men of 4 of the companies represented seasoned troops in training from 5 to 6 months.

Every company of raw recruits, with one exception, showed an initial loss in weight averaging 1 lb., followed by the end of the third week by an average gain of 1 lb. over the original weight. There was also an initial loss in strength, with recovery practically completed by the third week.

The food consumption showed a wide variation which could not be correlated with the changes in strength and weight. The average food consumption of the seasoned troops was somewhat higher than that of recruits but showed as great variations.

**Note on the acid-base balance of Army rations**, N. R. Blatherwick (*Amer. Jour. Physiol., 49 (1919), No. 4, pp. 567–572, fig. 1*).—Tables are given of the acid-base balance of Army rations at a number of camps and at base hospitals connected with two of these camps. Some of the regular camp diets were strongly acid-forming, some about neutral, and others base-forming. There was a tendency, however, for the rations to be acid-forming in character. In the hospital dietaries, on the contrary, the base-forming elements were practically always in excess. The rations were in all cases found to contain more calcium, phosphorus, and iron than the usually accepted standards.

Investigations of the possible relationship of diet to disease were conducted at Camp Wheeler and Camp Devens. In the former, a rough parallelism was indicated between the duration of disease (measles, mumps, influenza, and pneumonia) and the amounts of meat supplied. In the latter no relationship was shown between the excess acid in the rations or the calorific intake and the influenza rate. The results obtained at Camp Wheeler are thought to suggest the possibility that an acid-forming diet consumed for long periods of time may lead to a greater susceptibility to diseases of the less infectious type.

**Dried vegetables for Army use**, S. C. Prescott (*Amer. Jour. Physiol., 49 (1919), No. 4, pp. 573–577*).—This is a general discussion of the advantages in the military use of dried vegetables, with suggestions as to the best means to secure good products.

**American military hospital dietaries**, R. G. Hoskins (*Amer. Jour. Physiol., 49 (1919), No. 4, pp. 578–587, figs. 2*).—In addition to a discussion of the problems of military hospital nutrition, which are treated in greater detail in a previous communication (E. S. R., 40, p. 866), tables are given and discussed of the quantitative data available on the actual food consumption in Army hospitals and medical organizations, of a detailed ration study at a base hospital for seven consecutive days, of the metabolism of an ambulance company, and of the average daily expenditure for certain foods for six months in the messes of the patients, detachments, officers, and nurses of a base hospital.

The average calorific consumption of different diets based on varying numbers of studies was as follows: Liquid diet (one study) 900 calories with normal distribution of protein, fat, and carbohydrate; light diets (two studies comprising 3,734 rations), 2,225 calories with 15 per cent protein and 29 per cent fat; regular diets (ten studies comprising 29,827 rations), 3,236 calories with 35 per cent fat and slightly low protein and carbohydrate content; sick officers' ward (one study comprising 137 rations), 3,570 calories with 39 per cent fat;

hospital attendants and patients fed the same meals (four studies comprising 6,405 rations), 3,464 calories with normal fat, slightly low protein, and slightly high carbohydrate consumption; nonpatient groups (19 studies comprising 31,709 rations), 3,828 calories with approximately normal distribution of protein, fat, and carbohydrate; nurses' mess and officers' mess included in the above nonpatient group 2,859 and 3,695 calories, respectively.

Attention is called to the dietary idiosyncracies of medical officers, overconsumption, inadequate balance, and high wastage constituting the rule in such messes. This is further brought out in a table showing the average daily expenditure for certain items of food for six months in the different messes of a certain base hospital. The food items included meat, eggs, fresh milk, butter, fresh fruit, fresh vegetables, and canned milk. The daily expenditure for these items and the total daily expenditure per person were, respectively, as follows: Patients' mess 38.3 and 56.4 cts., detachments' mess 35.4 and 48.6, nurses' mess 32 and 46.1, and officers' mess 80 and 101 cts.

**A preliminary study of the energy expenditure and food requirements of women workers,** O. ROSENHEIM (*Proc. Roy. Soc. [London], Ser. B, 91 (1919), No. B 635, pp. 44–61, fig. 1*).—The investigation reported in this paper deals with women performing lathe work only. The general plan of the experiments was to determine by indirect calorimetry the energy expenditure of an average adult woman during 24 hours, divided into three approximately equal periods of sleep, work, and recreation. The determinations were made by the Douglas bag method as described by Cathcart (E. S. R., 41, p. 172), a fireman's smoke mask being used in most of the experiments in place of the usual valve, head, and mouthpiece. Statistical data are given of the results obtained with six normal subjects in periods of standard or basal metabolism, metabolism during nonworking hours, and metabolism during work, the latter being divided into light, medium hard, and hard work.

The average basal metabolism calculated by the DuBois formula was found to be 37 4 calories per hour per square meter of body surface, with a maximum variation from the mean of from —2.5 to +4 per cent. This is in close agreement with the figure of 37 calories (with ±10 per cent maximum variation) given by Gephart and DuBois (E. S. R., 35, p. 370) as the average basal heat production of adult women between the ages of 20 to 50 years. The average resting metabolism was only slightly higher than the basal. The energy expenditure during horizontal walking at the rate of from 2.7 to 3.1 miles per hour varied considerably with the different subjects, due largely to their previous occupational training, the average for five subjects being 139.8 calories per hour per square meter of body surface. The results in general indicate that women expend practically the same amount of energy as men in moving horizontally 1 kg. of body weight through a distance of 1 meter.

The metabolism during work showed individual variations in work economy, particularly during hard work. The average increase in heat production over the standard was 72 per cent for light work, 109 per cent for medium hard work, and 181 per cent for hard work, as compared with 274 per cent for walking. These results indicate that the energy required for lathe work is relatively small.

The daily food requirements of women lathe workers as calculated from the data obtained varied from 2,400 to 2,800 calories. This is in absolute agreement with the recommendations made by Hill (E. S. R., 40, p. 865) for moderate munition work, as based on statistical inquiries.

In conclusion the author emphasizes the importance, in assessing the food requirements of women workers, of paying due consideration not only to the

quantitative but to the qualitative side, particularly to insure adequate amounts of the accessory factors or vitamins.

Gastric responses to foods (*Amer. Jour. Physiol., 49 (1919), No. 2, pp. 174–232, 254–270, figs. 94*).—Four papers are presented in continuation of the studies previously noted (E. S. R., 41, p. 467). The digestion of various forms of meat and eggs in the normal human subject was studied by the fractional method, the contents of the stomach being withdrawn at regular intervals and determinations made of free and total acid, pepsin, and amino nitrogen.

III. *The response of the human stomach to beef and beef products*, H. R. Fishback, C. A. Smith, O. Bergeim, R. A. Lichtenthaeler, M. E. Rehfuss, and P. B. Hawk (pp. 174–203).—In this and the following studies it was found that all normal stomachs do not respond alike to the entrance of the same food, some responding very quickly and others slowly. The same difference was noted in the evacuation time. In consequence the subjects have been classified throughout the studies as having rapid- or slow-emptying stomachs.

The general results obtained in this study of the digestion of various forms of beef and beef products may be summarized as follows:

Roast beef and beef steaks appeared to be as readily digested if cooked rare as if medium or well done, rare roast beef apparently having a slight advantage in this respect. Roast beef was found to lie between the cheaper and tougher cuts of steak and sirloin and tenderloin steak in gastric response and evacuation time, the cheaper cuts of meat being handled more rapidly in the same individual than the more expensive cuts. Hamburger steak, stewed beef, boiled corn beef, dried beef, and beef bologna were handled by the stomach in the same length of time as roast beef, while calves' liver, beef tongue, and tripe required a slightly longer time and frankfurters and sweetbreads a shorter time.

For 100 gm. of the beef products tested, an average evacuation time of 2 hours and 35 minutes was obtained on subjects with stomachs of the rapid-emptying type, and 3 hours and 25 minutes with the slow-emptying type. The maximum total acidity obtained, expressed in cubic centimeters of N/10 alkali required to neutralize 100 cc., was 184 and the average total acidity at the height of digestion 120. It is pointed out that these high acid values regularly shown by normal men necessitate a revision of the older ideas of hyperacidity.

The amino acid nitrogen values (which include ammonia) were moderately high at the beginning of digestion due to the ammonia of the meat, increased as digestion proceeded, and fell to a low level at the end of the digestion. Pepsin values were highest toward the end of digestion.

IV. *The response of the stomach to pork and pork products*, C. A. Smith, H. R. Fishback, O. Bergeim, M. E. Rehfuss, and P. B. Hawk (pp. 204–221).—For individuals with stomachs of the rapid-emptying type the general average evacuation time for pork products was 2 hours and 45 minutes, and for subjects of the slow-emptying type 3 hours and 40 minutes. The average total acidity at the height of digestion was 117. Liver and bacon required about the same period of gastric digestion as roast beef, pork sausage a slightly longer time, and roast pork, pork chops, scrapple, bacon and most forms of ham a still longer time. Ham sandwiches were more readily handled than most of the other pork products.

V. *The response of the stomach to lamb and lamb products*, H. R. Fishback, C. A. Smith, O. Bergeim, M. E. Rehfuss, and P. B. Hawk (pp. 222–232).—Lamb was found to require an average of 2 hours and 30 minutes to digest for the rapid-emptying type of stomach, and 3 hours and 20 minutes for the slow-emptying type. The average total acidity at the height of digestion was 134. On the average, roast lamb remained in the stomach a few minutes longer

than roast beef, but not so long as roast pork. Stewed lamb required a somewhat longer period for digestion than roast lamb or lamb chops. Sheep brains left the stomach rather rapidly.

VI. *Digestion in the normal human stomach of eggs prepared in different ways*, R. J. Miller, H. L. Fowler, O. Bergeim, M. E. Rehfuss, and P. B. Hawk (pp. 254–270).—In addition to fresh eggs prepared in all the usual ways, tests were made with frozen and cold-storage eggs, duck and turkey eggs, the Chinese preserved duck egg called "pidan," and various combinations of eggs with other food materials.

In general eggs were distinguished from meat by the lower acidities which they provoked and by their more rapid evacuation. The average evacuation time for all egg preparations was for the first class 2 hours and 15 minutes and for the second class 3 hours and 5 minutes. The average of the highest acidities developed was 80 as compared with 120 for beef.

Raw egg white left the stomach much more rapidly than any other form of egg preparation, particularly when mixed with orange juice. The use of "orange albumin" in the diet of invalids would therefore appear to be supported from the standpoint of gastric digestion. Whole raw eggs were not handled so rapidly as either soft or hard cooked eggs. Eggs fried in the ordinary way and not turned left the stomach rather more rapidly than eggs cooked in any other way. Scrambled eggs and omelet required a somewhat longer time for digestion than hard or soft eggs and poached and shirred eggs.

Cold storage and mixed eggs could not be distinguished from fresh eggs as far as the response to the stomach was concerned. The eggs of the duck and turkey produced no difference in gastric response other than that caused by their greater bulk. "Pidan" gave rise to delayed and low acid responses and delayed evacuation.

Eggs and milk left the stomach a little more slowly than eggs alone, eggs with bread in about the same time as hard boiled eggs, bacon and eggs as rapidly as fried eggs alone, and frizzled beef with scrambled eggs as rapidly as scrambled eggs alone.

**The influence of diet on teeth formation**, M. Mellanby (*Lancet [London], 1918, II, No. 23, pp. 767–770, figs. 4*).—In this preliminary paper experimental work with puppies is described in which the problem has been investigated of the factors involved in the development of sound teeth and of the growth of the jaws in relation to the size of the teeth.

The results obtained indicate that a deficiency of fat-soluble A in the diet is accompanied by abnormal development of the teeth. A diet containing in abundance articles with which the fat-soluble A is associated (cod liver oil, butter, etc.), allowed the development of sound teeth, while a diet otherwise adequate but deficient in fat-soluble A brought about delayed loss of deciduous teeth, delayed eruption of the permanent dentition, irregularity in position and overlapping, especially of the incisors, partial absence of or very defective enamel, and low calcium content. These results are thought not to be due to acute illness or malnutrition, as an improvement to the teeth was brought about by the addition of substances containing fat-soluble A, and the defective teeth appeared to be most pronounced in rapidly growing puppies.

Attention is called to the work of E. Mellanby on rickets previously noted (E. S. R., 41, p. 365), which puts on an experimental basis the intimate connection between this disease and hypoplasia of the teeth.

**The effect of cow's milk and human milk upon smooth muscle**, O. B. Meyer (*München. Med. Wchnschr., 66 (1919), No. 12, pp. 315–318, figs. 2*).—In an attempt to determine whether the biological differences between cows' milk and

human milk might be attributed to the presence of adrenalin in different amounts, the effect of both kinds of milk upon smooth muscle was determined.

It was found that cow's milk produced a contraction in the muscle similar to that produced by a solution of adrenalin, and that human milk produced only a very slight contraction. While the resemblance to the adrenalin curve was quite marked, sufficient evidence was obtained to indicate that the contraction was not due to adrenalin. Further experiments, conducted with a view to determining the cause of the contraction established the fact that dialysed cow's milk, with the addition of 3 per cent of milk sugar, gave a curve with smooth muscle practically identical with that of human milk. This suggests the practicability of using dialysed cow's milk in infant feeding.

While the question of the cause of the effect of milk upon smooth muscle is still open, the author feels that further evidence is given by the experiments reported to support the view that the salts and milk sugar are partly responsible for the action.

**Regeneration of blood serum proteins**, W. J. Kerr, S. H. Hurwitz, and G. H. Whipple (*Amer. Jour. Physiol., 47 (1918), No. 3, pp. 356–392, fig. 1*).—The results of a study of the regeneration and source of blood proteins, their fluctuation under abnormal conditions, and their function in the body economy are presented in the following papers:

I. *Influence of fasting upon curve of protein regeneration following plasma depletion.*—Dogs were used as experimental animals, and plasma depletion was effected by bleeding the animal from the artery and introducing into the vein red corpuscles washed and suspended in Locke's solution. By this method, the blood serum proteins, as measured by the refractometric method, could be reduced to a low level (33 per cent or even 20 per cent of normal).

The regeneration took place very slowly, whether food was administered or not, complete regeneration occupying from 7 to 14 days when the original depletion removed 50 per cent or more of the total serum proteins. The ability of the body to regenerate serum proteins while fasting and the lack of evidence of any constant fluctuation in serum proteins in association with periods of fasting or heavy protein feeding are thought to indicate that the serum proteins are not concerned as intermediary products between food protein and body tissue or parenchyma protein, and that their formation under certain circumstances may be attributed to the body proteins.

II. *Influence of diet upon curve of protein regeneration following plasma depletion.*—Experiments are reported which supplement those noted above by showing the effect of different diets upon serum protein regeneration.

The regeneration was found to be more rapid and complete upon a meat or mixed diet than in fasting, and more rapid upon a meat diet than a bread and milk diet. Following plasma depletion there was an average regeneration of 1 per cent of the total serum proteins within the next 24 hours, independent of food, shock, or infection. This is thought to represent the absolute maximum production under the greatest stimulus.

It is pointed out that regeneration of serum proteins on a meat diet after a 50 per cent depletion and regeneration of liver cell protoplasm after a 50 per cent necrosis both require from 5 to 7 days, suggesting that the body has the same difficulty in regenerating its serum proteins that it does in the construction of cell protein.

III. *Liver injury alone: Liver injury and plasma depletion: The Eck fistula combined with plasma depletion.*—In this paper experiments are reported which show that "liver injury tends to lessen the amount of circulating blood serum proteins, and the presence of liver injury tends to retard the regeneration of serum proteins after an initial plasma depletion. Furthermore, the

Eck fistula liver appears to regenerate blood serum proteins more slowly than the normal or even the injured liver. The Eck fistula liver is smaller than normal, always presents evidence of degeneration (fat), and gives a subnormal functional test with tetrachlorphthalein."

This experimental evidence is thought to indicate that the liver is concerned in maintaining the normal level of the blood serum proteins, which is remarkably stable in widely varying conditions of health and disease.

**An investigation of changes in the blood and urine resulting from fatigue**, A. B. HASTINGS (*Pub. Health Rpts. [U. S.], 34 (1919), No. 31, pp. 1682–1691, fig. 1*).—The studies reported were made for the most part on the urine of men and the blood of dogs, although in a limited number of cases data were obtained on both the urine and blood of the same subject. Fatigue was induced in the animals by causing them to run in a revolving wheel, and later in a motor-driven treadmill. Data on the reaction of the urine of men at rest were obtained from men convalescing from minor surgical operations, and on fatigued subjects from men engaged in mechanical operations in an automobile factory, from men participating in a 12-mile Marathon race and a 6-day bicycle race and from a man on a 10-mile walk. The reactions of blood plasma and urine were determined electrometrically with a Clark electrode, and the reserve alkali of the blood plasma by the Van Slyke method for the determination of bound carbon dioxid. The character and amount of the food eaten were noted only in the case of the hospital patients. The general results obtained were summarized as follows:

Exercise produced a diminution of the bound carbon dioxid of the blood plasma which, however, did not progress to such a point that the reaction of the plasma was significantly altered. The rate of change of the bound carbon dioxid was a function of the rate and amount of exercise.

The urine of men engaged in manual labor tended to be of a slightly higher degree of acidity than that of men at rest. The urine of physically strong men was regularly slightly more acid after work than before, while that of physically weak men showed wide variations in reactions from day to day. Intense fatigue invariably resulted in an increase in the H-ion concentration of the urine.

**Experimental scurvy in monkeys**, A. HARDEN and S. S. ZILVA (*Jour. Path. and Bact., 22 (1919), No. 3–4, pp. 246–251*).—Three experiments are reported in which scurvy was induced in monkeys by the following diets: (1) Fresh beer, steamed wheat germ, and autoclaved bread, rice, and monkey nuts; (2) autoclaved rice, bread, and autoclaved milk; and (3) a diet similar to the first with the substitution of autoclaved milk for the beer.

In all cases an acute scorbutic condition developed in from three to four months, the symptoms in the first two cases being confirmed by the histological changes noted on autopsy. In the third experiment, the animal was cured in less than a week by the addition of lemon juice treated as described in a previous article (E. S. R., 40, p. 364).

**An investigation of the antiscorbutic value of the raw juices of root vegetables, with a view to their adoption as an adjunct to the dietary of infants**, H. CHICK and M. RHODES (*Lancet [London], 1918, II, No. 23, pp. 774, 775*).—By the usual feeding experiments with guinea pigs, the basal diet being oats and wheat bran ad libitum with 60 cc. of milk autoclaved at 120° C. for one hour, the authors have found raw swede juice to have antiscorbutic properties approximating in value to raw orange juice, protection from scurvy being attained with a daily ration of 2.5 cc. The raw juice of carrots was found to be inferior to that of swedes, 20 cc. being required to produce protection from

scurvy. The juice of beet roots failed to prevent scurvy in the largest dose (20 cc.) that could be administered.

For purposes of comparison a table is given showing the relative antiscorbutic properties of the above-mentioned juices and of cooked potato, fresh raw cabbage leaves, fresh orange juice, and fresh grapes. The juice of grapes was found to have a value of only about one-tenth that of oranges.

**A note on the value of germinated beans in the treatment of scurvy, and some points in prophylaxis,** H. W. Wiltshire (*Lancet [London], 1918, II, No. 24, pp. 811–813*).—The author confirms the conclusions of Chick and Hume (E. S. R., 40, p. 868) as to the antiscorbutic value of germinated seeds, by reports of the successful use of germinated haricot beans in the treatment of scurvy in the Serbian army in 1917. The amount of antiscorbutic vitamin developed in the beans upon germination is thought to be equal to, if not greater than, that contained in fresh lemon juice. Even if no allowance be made for the food value of the beans, the cost of vitamins supplied by them is estimated at only 60 per cent of the cost when supplied by lemons.

**Beer and scurvy,** A. H. Smith (*Lancet [London], 1918, II, No. 24, pp. 813–815*).—Conflicting reports from the literature of the value of beer in the prevention of scurvy are recorded briefly, and the explanation is advanced that the difference in results is due to the process of malting. With the elaboration and perfection of the malting and brewing processes the antiscorbutic vitamin, which was probably present in the earlier beers, having its source in the germinated grains, has been practically eliminated.

**A historical inquiry into the efficacy of lime juice for the prevention and cure of scurvy,** A. H. Smith (*Jour. Roy. Army Med. Corps, 32 (1919), Nos. 2, pp. 93–116; 3, pp. 188–208, fig. 1*).—This is a more detailed report of the historical inquiry noted above.

**The antiscorbutic properties of raw lean beef,** R. A. Dutcher, E. M. Pierson, and A. Biester (*Science, n. ser., 50 (1919), No. 1286, pp. 184, 185*).—A preliminary report is given of feeding experiments with guinea pigs which indicate that raw lean beef does not possess antiscorbutic properties.

## ANIMAL PRODUCTION.

**Mitosis and amitosis,** E. G. Conklin (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 33 (1917), No. 6, pp. 396–436, pls. 10*).—This is a discussion of purported cases of amitotic cell division to be found in the literature of cytology, supplemented by a study of the cleavage of the egg of the mollusk *Crepidula plana*. The author's point of view may be seen from the following statements:

"The modern revival of interest in amitosis is due to a reaction against the chromosome theory [of heredity]. If nuclear and cell divisions ever take place by amitosis in normally developing sex cells and embryonic cells it would deal a fatal blow to that theory. The occurrence of amitosis in fully differentiated tissue cells or in cells which do not undergo division would not affect the chromosome theory. . . . There is not a single wholly conclusive case in which amitosis has been shown to occur in the division of normally differentiating cells. Therefore the attempts to disprove the chromosome theory in this way have failed."

Four types of modified mitosis which resemble amitosis are described.

**Studies on cytolysins.—I, Some prenatal effects of lens antibodies,** M. F. Guyer and E. A. Smith (*Jour. Expt. Zool., 26 (1918), No. 1, pp. 65–82*).—Pregnant rabbits, injected with serum from chickens sensitized by previous injections of a suspension of rabbit crystalline lenses, and pregnant deer mice of the genus Peromyscus, injected with fowl serum similarly sensitized to the

proteins of Peromyscus lenses, produced young, a few of which had liquified instead of fibrous crystalline lenses. It is held that the lenses excited the production of specific antibodies in the fowl blood, and that these in turn attacked in utero the lenses of the young of the species used as antigen. The lenses of the mothers were not altered.

**Observations on the relation between suckling and the rate of embryonic development in mice**, W. B. KIRKHAM (*Jour. Expt. Zool., 27 (1918), No. 1, pp. 49–55*).—The author reports experiments and embryological investigations showing that the delay which he had previously discovered (E. S. R., 40, p. 469) in the implantation of embryos in the uterus of female mice simultaneously pregnant and lactating is induced by full functional activity of the mammary gland. The extent of the delay seems not to be correlated with the size of the suckling litter. The influence of the gland varies markedly in different individuals.

**The experimental production of hypotypical ovaries through underfeeding.—A contribution to the analysis of sterility**, L. LOEB (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 33 (1917), No. 2, pp. 91–115*).—In a series of experiments 26 sexually mature female guinea pigs received their accustomed feeds—oats and green feed—in amounts not sufficient to maintain body weight for from 6 to 33 days. In most cases the weight decreased 25 to 35 per cent. Of 8 animals intended as controls, 1 lost 20 per cent of her weight in spite of abundant feed but the others maintained weight, ovulated normally, and 3 became pregnant. In 18 of the experimental animals and in the exceptional control the ovaries became definitely hypotypical—that is, atresia of follicles set in before the follicles reached normal size. In such animals ovulation is effectually prevented and the animals are sterile, at least temporarily. The uterus was found to be in a resting condition. The connective tissue of the ovary was more resistant to the experimental treatment than the granulosa cells.

**The concrescence of follicles in the hypotypical ovary**, L. LOEB (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 33 (1917), No. 3, pp. 187–195*).—The author describes the ovaries of an underfed guinea pig, in which the hypotypical condition was so advanced that the connective tissue was affected and neighboring follicles became united. "The concrescence of ovarian follicles is analogous to the union of neighboring acini in the mammary gland and thyroid. It is a phenomenon which occurs probably in all or the majority of glandular structures."

**The effect of alcohol on the reproductive tissues**, A. H. ARLITT and H. G. WELLS (*Jour. Expt. Med., 26 (1917), No. 6, pp. 769–778, pls. 4*).—Male and female white rats, mostly 6 to 9 months old, were given daily doses of ethyl alcohol with the food for a period of time and were then killed. Histological preparations were made of the reproductive and other tissues.

The treatment resulted in no apparent changes in the lungs, liver, kidneys, spleen, stomach, heart, or ovaries, but profound disturbances were found in the testes of 14 of the 15 males. The seminiferous tubules were reduced in size with compensatory edema of the intertubular tissue. Spermatozoa were absent in some cases, in others they were reduced in number or lacked tails, and in still others spermatids were numerous but apparently had been prevented from undergoing further transformation. Individual tubules of the same testis often showed considerable differences and individual differences between males were marked. The daily dosage varied from 0.25 to 2.25 cc. and the period of administration from 2 to 10 months, but it was found impossible to correlate the intensity of the histological changes with the severity of treatment.

Measurements, made by C. L. Chapin, of the diameter of the seminiferous tubules of each individual are recorded.

**Further studies on the modification of the germ cells in mammals.**—The effect of alcohol on treated guinea pigs and their descendants, C. R. Stockard and G. N. Papanicolaou (*Jour. Expt. Zool., 26 (1918), No. 1, pp. 119–226, figs. 8*).—The authors present the results obtained during the sixth and seventh years of a study of the descendants of a number of guinea pigs that had been caused to inhale fumes of ethyl alcohol for an hour or more six days a week during periods of several months. The results of earlier years have been noted (E. R. S., 35, p. 65).

The report deals mostly with 594 progeny of alcoholic lines (four generations) and 233 of untreated lines, both stocks systematically mated to avoid inbreeding, but some information is also furnished concerning 302 individuals of inbred alcoholic stock and 41 untreated inbred animals. Since the previous report the mating technique has been improved through a study of the estrus cycle (E. R. S., 40, p. 467). Matings were made by placing a female in heat alone in a cage with a male. If a month later upon careful physical examination she was found to be pregnant, the mating was considered successful and the number of progeny produced was reckoned as of that date. The number of fetuses in utero was determined by palpation at intervals until parturition and a careful watch was kept for abortions. The young not accounted for at birth were assumed to have died and been absorbed in the manner discussed by Meyer (E. R. S., 40, p. 663). The accuracy of the palpation counts was checked by a number of autopsies of pregnant females.

The data from the noninbred stock are tabulated in three different ways according to (1) the number of generations since the most recent alcoholic ancestor without regard to the latter's sex, (2) whether the paternal or maternal stock or both were alcoholic, without distinguishing between generations except the immediate parents, and (3) whether the alcoholic ancestors were exclusively males, exclusively females, or of both sexes, likewise without discriminating between the more remote generations. The third method shows perhaps the most striking differences and is summarized below:

*Condition of young from matings of guinea pigs exposed to alcohol or descended from alcoholic stock.*

| Character of mates. | | Mates' ancestors treated with alcohol. | Number of matings made. | Matings unsuccessful.[1] | Young[1] per successful mating. | Average weight of litter at birth. | Young[1] in litters of 4 or 5. | Young alive 3 months after birth. | Relative corrected death rate. | Proportion of deaths that were prenatal. |
|---|---|---|---|---|---|---|---|---|---|---|
| Male. | Female. | | | | | | | | | |
| | | | | *Per ct.* | | *Gm.* | *Per ct.* | *Per ct.* | | *Per ct.* |
| Normal.. | Normal.. | None..... | 88 | 4.5 | 2.77 | 197.1 | 37 | 77.7 | 100 | 51.9 |
| Alcoholic | ...do..... | .....do..... | 34 | 23.5 | 2.30 | 170.4 | 20 | 66.7 | 178 | 60.0 |
| Normal.. | Alcoholic | .....do..... | 35 | 5.7 | 2.78 | 171.6 | 17 | 48.9 | 281 | 74.5 |
| Do.... | Normal.. | One or more males... | 72 | 19.4 | 2.50 | 173.3 | 24 | 62.8 | 198 | 79.6 |
| Do.... | ...do..... | One or more females.. | 33 | 3.0 | 2.56 | 175.5 | 15 | 72.0 | 152 | 60.9 |
| Do.... | ...do..... | Some of both sexes... | 86 | 12.8 | 2.41 | 170.7 | 19 | 69.1 | 161 | 64.3 |

[1] One month after opportunity for copulation.

No litters of more than five young were observed in these experiments. Since the death rate was higher in large than in small litters, and since the proportion of large litters varied in the different groups of matings, it was necessary to eliminate as far as possible the influence of litter size from the mortality data. As used in the table, the relative corrected death rate of the young of a particular group expresses the observed death rate as a percentage of the

rate which the normal group would have exhibited had the distribution of litter sizes been the same as in the group under consideration.

That a high proportion of unsuccessful matings (indicative of early death of embryos or low fertility or both), a small sized litter, and a low litter weight are characteristic of both the matings with a treated male and those with alcoholic male ancestors is held to "prove the hereditary transmission of the defects arising from the treatment of the male animals." The general similarity of the two groups of young derived from alcoholized females indicates that "the treatment of female individuals also induces effects that are transmitted to later generations through the germ cells." The high mortality of the offspring of an alcoholized mother is attributed in part to the direct influence of the treatment. The authors consider the results secured by Cole and Davis[1] (who found that spermatozoa of treated rabbits were handicapped in a direct competition with normal spermatozoa), and by Arlitt and Wells (noted above) to be of significance in explaining the intensity and the racial persistence of the effects of alcoholizing male guinea pigs.

The ratio of males to females was 109.2:100 in young with fathers or other male ancestors treated, 86.5:100 in those with only female ancestors treated, and 123.6:100 when ancestors of both sexes had been treated. The ratio in the normal line was 113.2:100. These wide differences are discussed, but inasmuch as the normals showed an unusualiy high proportion of males no certain conclusions are drawn, although the possibility of higher prenatal mortality on the part of the females of alcoholic stock is pointed out.

About 2.52 per cent of the noninbred young of alcoholic stock and 3.31 per cent of the inbred alcoholics were conspicuously malformed in some particular (abnormally small eye on one side, cataract, opaque lenses, deformed limbs, etc.) or showed paralysis, gross tremors, and the like. In none of the untreated stock, inbred or not, were such defects noted.

In attempting to reconcile their results with those of Pearl on the domestic fowl (E. S. R., 40, p. 470), the authors are inclined to hold that many of the "infertile" eggs in Pearl's experiments contained embryos that died in early cleavage stages.

**Studies on inbreeding.—I–IV**, H. D. King (*Jour. Expt. Zool., 26 (1918), Nos. 1, pp. 1–54, figs. 14; 2, pp. 335–378, figs. 2; 27 (1918), No. 1, pp. 1–35, fig. 1; 29 (1919), No. 1, pp. 71–111, figs. 8*).—The observations reported in these four papers cover 25 generations of inbred white rats reared at the Wistar Institute. The experiments were started with a litter consisting of two males and two females born in May, 1909. One of the females was called A and the other B; their inbred descendants are respectively designated the A and the B series. The plan required that A and B and every other female used for breeding should be mated twice with a brother from the same litter and then twice with an unrelated stock male. Young from the latter matings were not used to carry on the inbred line.

During the first six generations the diet consisted mostly of milk, bread, and corn, and many of the rats remained undersized, developed deformed teeth and other malformations, and produced small sized litters. These defects are not attributed to inbreeding, as they were also abundantly manifested by the rest of the rat colony. The diet was then changed to selected table refuse supplemented by ear corn or dog biscuit, and all evidence of malnutrition disappeared. Less marked nutritive disturbances were, however, again met with during the

[1] The Effect of Alcohol on the Male Germ Cells studied by means of Double Matings, L. J. Cole and C. L. Davis. Abs. in Science n. ser., 39 (1914), No. 1004, pp. 476, 477.

last few generations, since table scraps became scarce and of low grade and no satisfactory substitute was found.

The animals produced in the first six generations were so few that practically all that lived were bred from. Beginning with the seventh, however, it was possible to inaugurate a system of selection which is described as follows: "In the A series of inbreds, which is called the 'male line,' all litters containing an excess of female young were always discarded; in the B series, the 'female line,' litters with an excess of male young were never reared. Unless the individuals in the litter were of normal size and vigorous at birth they were killed at once." Additional eliminations took place at the age of one month and at sexual maturity (3 months), all animals not meeting the requirements of normal weight, as given by Donaldson (E. S. R., 40, p. 546), and normal vigor being discarded.

The subtitles of the individual papers and the main topics treated therein follow:

I. *The effects in inbreeding on the growth and variability in the body weight of the albino rat.*—This paper summarizes (1) the adult body weights of 177 male and 137 female rats of generations 1 to 6, and (2) the systematic monthly weighings of 156 males and 169 females of generations 7 to 15 during the first 15 months of their lives. For this second set of measurements from 3 to 5 litters of each series were selected for study in each generation, the litters chosen being of medium size (5 to 8 young) and composed of individuals normal in size at birth. "There was no culling of the less desirable individuals, however, and all members of every litter were reared and weighed at the ages noted."

Inbred males belonging in generations 7 to 15 were heavier at all ages than stock albinos. In the adult state they were on the average, 18 per cent heavier than the general run of stock albinos and about 12 per cent heavier than males from a selected stock series reared under the same environmental conditions. Inbred females were, as a rule, slightly heavier at any given age than the females of the control series, but the difference between the two groups was much less marked. At the age of one year the average body weight of the inbred females was 3.7 per cent greater than that of the stock females. Some males of the seventh to ninth generation were the largest specimens of the albino rat on record.

The animals of the B series were somewhat heavier at all ages than those of corresponding sex in the A series. In both series the variability of the body weights—as measured by the coefficient of variation—was lower in the later than in the earlier generations.

II. *The effects of inbreeding on the fertility and on the constitutional vigor of the albino rat.*—Litter size, age at sexual maturity, fertility, mortality, and behavior are the topics considered in this paper.

The average number of young in a litter in the A series (1,752 litters) was 7.5 and in the B series (1,656 litters) 7.4. The average in a stock of noninbred albinos (424 litters) kept under the same environmental conditions was 6.7. These averages include the first four litters cast by each female or a lesser number in those cases where four were not secured. There were some changes in litter size in the inbred series as the experiment progressed. The average was 6.8 for generations 1 to 6, 7.2 for generations 7 to 10, 7.5 for generations 11 to 14, 7.7 for generations 15 to 18 and 19 to 22, and 7.4 for generations 23 to 25. Inbred females in giving birth to their first litters produced 6.9 young on the average. The second litters averaged 7.9, the third 7.8, and the fourth 7.3. The averages for the successive litters of the stock females were 6.2, 7.3, 6.5, and 6.7 young, respectively.

In the earlier generations malnutrition delayed the time of puberty. In the latter generations considerably more than 25 per cent cast their first litter before the age of 90 days, while less than 10 per cent were more than 120 days old at the time of first parturition. Of the 594 females used for breeding, 68.5 per cent produced the required four litters. The majority of the others died of pneumonia. A few remained barren after one or two litters; post-mortem examinations revealed inflamed ovaries or uterus in these cases. These facts are held to indicate that the inbreeding did not induce sterility. The mortality records indicate that the span of life was longer in the inbred animals than in ordinary stock.

The behavior of some of the inbred animals used in this experiment has been studied by A. W. Yerkes[1] and by N. Utsurikawa.[2] These investigators found that the inbred rats learned their way out of a maze more slowly than stock rats, and were more timid, more savage, and less active. It is suggested that perhaps nervousness is an hereditary trait that is intensified through inbreeding and that the nervousness of many pure bred domestic animals, notably race horses, is associated with the inbreeding (in a broad sense) frequently practiced by breeders of registered stock.

III. *The effects of inbreeding, with selection, on the sex ratio of the albino rat.*—The ratio of males to females among the 2,818 individuals of the 424 litters of stock animals used as controls was 104.6:100. The ratio among the 3,256 inbred animals in the six generations before selection began was 108.6:100. The young of the A series (male line) in generations 8 to 25 that were produced in first and second litters (sired by inbred males) showed a ratio of 122.3:100. Among young in the third and fourth litters of the A series females (sired by stock males) the ratio was 115.6:100. Breeding females of the B series (female line) in generations 8 to 25 produced male and female young in the proportion of 81.1:100 when mated to inbred males, and in the proportion of 91.1:100 when mated to stock males.

It is concluded that by selection the inbred rats have been separated into two distinct strains showing radically different sex ratios.

IV. *A further study of the effects of inbreeding on the growth and variability in the body weight of the albino rat.*—This paper completes study I by presenting the growth data for 296 males and 310 females of generation 16 to 25. These rats were not so heavy at any age period as those of the earlier generations, but they were much superior in weight to stock albinos reared under similar conditions of environment and nutrition. Variability did not tend to decrease with the advance of inbreeding. There were practically no differences in adult weights between the A and the B series.

By way of general conclusions, the author points out that selection for vigor is seemingly able to check any tendency for inbreeding to bring out undesirable latent traits, and that adverse housing and feeding conditions are capable of producing more detrimental effects on growth and fertility in the albino rat than is inbreeding.

A bibliography of nearly 200 titles on inbreeding, selection, sex ratios, and related topics is appended to the fourth study.

On a back cross in mice involving three allelomorphic pairs of characters, J. A. Detfelsen and E. Roberts (*Genetics, 3 (1918), No. 6, pp. 573–598*).—To discover (1) any linkage that might exist between three dominant hereditary

[1] Comparison of the Behavior of Stock and Inbred Albino Rats. Jour. Anim. Behavior, 6 (1916), No. 4, pp. 267–269, figs. 4.

[2] Temperamental Differences between Outbred and Inbred Strains of the Albino Rat. Jour. Anim. Behavior, 7 (1917), No. 2, pp. 111–129.

factors in mice—those for agouti hair-pattern, dark eye-color, and black body-pigment—and (2) any selective mortality of particular zygotic types in early postnatal life, a number of mice heterozygous for all three factors were mated to triple recessives at the Illinois Experiment Station. Most of the data secured were from a group of 90 $F_1$ wild gray×pink-eyed brown females crossed back to pink-eyed brown males. These females produced 361 litters (comprising 2,259 individuals) in which all the young lived during the two weeks after birth that necessarily elapses before the eye- and body-colors of young mice can be determined, and 170 litters (811 individuals) in which some of the young died during this period.

No evidence of linkage was found—indeed, in the undepleted series, of the eight classes of young the two that would have been the noncrossover classes were least numerous. There was, however, an indication of selective mortality, for noticeably fewer nonagoutis than agoutis were found among the depleted litters, while the two kinds were substantially equal in number in the undepleted litters.

**Fluctuations of sampling in a Mendelian population**, J. A. Detlefsen (*Genetics, 3 (1918), No. 6, pp. 599–607*).—The data furnished by the 531 litters from the $F_1$ females used in the experiment noted above were examined to see how closely the ratios in the individual litters approach the expected ratios. The statistical methods adopted are mainly those suggested by Harris (E. S. R., 29, p. 67). It is concluded that the observed deviations from expectation can properly be attributed to the chance fluctuations of random sampling.

**A demonstration of the origin of two pairs of female identical twins from two ova of high storage metabolism**, O. Riddle (*Jour. Expt. Zool., 26 (1918), No. 2, pp. 227–254*).—Two cases among ring doves are reported where an egg harbored two embryos which on dissection proved to be females. The eggs, which were laid by different birds, were very large but are held not to have been double yolked because (1) in one case the two-embryo condition was discovered early in incubation by candling and the relative position of the embryos could not be altered by rotation and shaking, and (2) in both cases the umbilici of each pair of fully formed embryos "had a practically common point of union on the [single, only partly absorbed] yolk-sac." The twins are termed identical because each pair is thought to have been derived from a single egg cell. The large size ("high storage metabolism") of the yolks is suggested as a factor in the separation of the blastomeres to form two embryos.

**Genetic variability, twin hybrids and constant hybrids, in a case of balanced lethal factors**, H. J. Muller (*Genetics, 3 (1918), No. 5, pp. 422–499, fig. 1*).—On the basis of extended breeding investigations which he reports with beaded-wing drosophilas, the author recognizes a condition where heterozygosis is enforced by two opposed lethal factors in the same linkage group which are inhibited from crossing over by a third factor, and designates this condition as one of balanced lethal factors. He uses this as an explanation of the existence both of "pure" beaded-wing stock and of stock in which the beaded-wing factor behaves like the factor for yellow in mice.

The author also points out that the factorial analysis of these flies has proceeded far enough so that various complicated and apparently non-Mendelian results, such as twin hybrids, constant hybrids, and the disappearance of dominant factors on crossing, can be made to order. If these cases occurred spontaneously the Mendelian mechanism at work might not be apparent, and the phenomena would be made much of by advocates of the theory of factor variability.

**Fluctuations in a recessive Mendelian character and selection**, E. Roberts (*Jour. Expt. Zool., 27 (1918), No. 2, pp. 157–192, figs. 25*).—Breeding experi-

ments at the Illinois Experiment Station with vestigial-wing drosophilas (pomace flies) are reported.

Selection for 34 generations failed to increase the length of the wings. Vestigial-wing flies extracted from a cross with wild long-wing flies bore longer wings and wings of more varied shapes than the stock which had not been crossed. This result is attributed to modifying factors brought in by wild flies, and not to "contamination." For seven generations certain of the extracted stock were kept in an incubator where the temperature, though variable, averaged about 2° C. above the room temperature where the rest of the stock were kept. The incubator flies developed longer wings than the outside flies, and the effect was more marked in the males than in the females.

**Selecting cattle for hornlessness**, E. N. WENTWORTH (*Breeder's Gaz., 76 (1919), No. 17, pp. 849, 850*).—The current view of geneticists as to the inheritance of the polled character in cattle is explained. It is pointed out that a long series of top crosses with polled animals does not ensure the "prepotency" of a polled sire.

**Commercial feeding stuffs, quarterly report, January 1 to March 31, 1919**, E. G. PROULX ET AL. (*Indiana Sta. Bul. 230 (1919), pp. 63*).—This is the first of the new series of quarterly reports of Indiana feeding stuffs, and tabulates the proximate composition of 982 samples analyzed during the first three months of 1919. The materials listed include alfalfa meal, buckwheat hulls and middlings, coconut oil meal, corn bran, corn feed meal, yellow corn feed meal, corn germ meal, corn gluten feed, hominy feed, yellow hominy feed, cottonseed cake, cottonseed feed, cottonseed meal, Kapok seed meal, linseed cake, linseed meal, oat middlings, palm kernel oil meal, peanut oil meal, rye middlings, velvet bean feed, wheat bran, wheat middlings, wheat shorts, red dog, white middlings, miscellaneous (mostly corn and oats) chop feeds, tankage, meat scrap, and mixed and proprietary stock, poultry, molasses, and condimental feeds and calf meals.

**Inspection of feeding stuffs** (*New York State Sta. Bul. 455 (1918), pp. 15–186*).—This is the report on the samples of feeding stuffs collected by the New York State Commissioner of Agriculture during 1918. The protein, fat, and fiber content of each sample is reported, together with the ingredients identified and in the case of animal by-products the phosphoric acid content. The materials analyzed include alfalfa meal, barley feed, barley middlings, barley hulls, brewers' dried grains, buckwheat middlings, coconut oil meal, corn bran, corn germ meal, corn gluten feed, corn meal, corn feed meal, hominy feed, yellow hominy feed, corn-and-cob meal, cottonseed meal, cottonseed feed, distillers' dried grains (corn), malt sprouts, dried yeast grains, dried beet pulp, linseed meal, unscreened flaxseed oil cake, oat hulls, oatmeal by-product, peanut oil feed, unhulled peanut oil feed, Spanish chestnuts, velvet bean feed, wheat bran, wheat middlings, red dog, wheat middlings and palm oil, wheat screenings, tankage, meat scrap, meat-and-bone scrap, beef scrap, fish meal, and various proprietary compounded chop, molasses, stock and poultry feeds, and calf meals.

**Poultry foods**, J. C. BRÜNNICH (*Queensland Agr. Jour., 11 (1919), No. 6, pp. 245, 246*).—Proximate analyses of market samples of Australian poultry feeds are summarized. The materials are meat-and-bone meal, pea meal, corn meal, bran, shorts, linseed meal (Meggit's), key meal, polly meal, and nine commercial mixed feeds. Besides the total ash determinations, the proportions of lime, phosphoric acid, and insoluble ash are tabulated. The market price of each feeding stuff is listed. An estimate of the actual monetary value of the ingredients of the mixed feeds indicates that the price asked for these is unduly high.

**Carrying capacity of ranges in western United States**, R. L. HENSEL (*Ames Forester, 5 (1917), pp. 45–49*).—Accessibility to water, topography, character of vegetation, prevalent diseases, local farming conditions, and extent of use are discussed as factors in determining the carrying capacity of a range.

**The cattle industry of the Southeast**, G. M. ROMMEL (*Producer, 1 (1919), No. 6, pp. 9–12, figs. 5*).—It is predicted that with the cattle tick eradicated the southern part of the United States, east of the Mississippi River, will become a very important cattle-growing region, partly because of an increasing demand for beef and partly because of the beneficial effect of the manure on the cotton crop.

The investigations of the Bureau of Animal Industry of the U. S. Department of Agriculture during the past 15 years (E. S. R., 41, p. 565) indicate in the author's opinion that the two most profitable methods of producing beef in the South are (1) to feed steers cottonseed meal on pasture, and (2) to feed calves for baby beef during the winter following weaning with a ration made up of silage, cottonseed meal, and other available feeds, but not corn except where the price is low.

**Cattle industry**, J. C. J. COOPE (*Rhodesia Munitions and Resources Com. Rpt. 1918, pp. 45–55*).—This article deals with the status of the beef cattle industry in Rhodesia. Available native feeding stuffs and common cattle diseases in the region are listed.

**Some camel feeding experiments**, H. E. CROSS (*Agr. Research Inst. Pusa Bul. 77 (1918), pp. 8*).—Experiments as to the amounts of various feeds that camels will consume are reported to show that the Indian Government's ration of 16 lbs. per day of a mixture of wheat and pea-straw is insufficient to maintain a camel.

**Domestication of animals in Peru**, O. F. COOK (*Jour. Heredity, 10 (1919), No. 4, pp. 176–181, figs. 3*).—Notes are given as to the degree to which the llama, the alpaca, the huanacu, the vicuña, and the guinea pig are under domestication in Peru, together with suggestions as to the part played by domestic animals in the highly developed agriculture of the prehistoric Peruvians.

**Making money from hens**, H. R. LEWIS (*Philadelphia and London: J. B. Lippincott Co., 1919, pp. 217, pls. 12*).—The scope of this book and the method of treatment are indicated by the following chapter headings: Chances with chickens; the riddle of the breeds; beginning with the incubator; beginning with the baby chick; critical days in the brooder; the secret of better chickens; the open-front poultry house; fuel for the egg factory; healthy hens; how to tell the good hen; the truth about the lighting problem. The "secret" of better chickens is to provide feeds rich in vitamins. Much of the material has appeared in somewhat different form in the series of leaflets known as Hints to Poultrymen, issued by the New Jersey Experiment Stations and noted from time to time.

**Fall poultry problems**, H. R. LEWIS (*New Jersey Stas. Hints to Poultrymen, 7 (1919), No. 12, pp. 4*).—The topics briefly discussed are the culling of the flock in the fall, the problems of sanitation, housing, and feeding during the fall and winter months, and the use of artificial illumination to stimulate egg production.

**Feeding hens for egg production**, H. M. LAMON and A. R. LEE (*U. S. Dept. Agr., Farmers' Bul. 1067 (1919), pp. 15, figs. 5*).—Information is summarized as to the composition of poultry feeding stuffs, suitable rations for laying hens, and methods of feeding. Rations are recommended on the basis of the experiments reported in Department Bulletin 561 (E. S. R., 37, p. 871).

Egg laying contests.—I, Sixth annual international egg-laying contest.—II, Report of the seventh competition and some five-year averages, W. F. KIRKPATRICK and L. E. CARD (*Connecticut Storrs Sta. Bul. 100 (1919), pp. 71, figs. 25*).—This bulletin presents detailed reports of the annual egg-laying contests held at Storrs, Conn., in 1916–17 and 1917–18, and also averages the egg records, feed consumption, costs and profits of the third to seventh contests. Reports of the fifth and preceding competitions have been noted (E. S. R., 37, p. 368).

The simplified feed mixtures adopted for the fifth contest were used during the sixth and seventh and are regarded as very satisfactory. The feeds available for the seventh were of lower grade than those used in the sixth and the difference is reflected in a higher feed consumption per pound of eggs. In spite of the increased cost of feed in recent years, the difference between receipts and feed costs per dozen eggs has steadily increased in successive contests. Two charts present separately for the White Leghorns, Wyandottes, Plymouth Rocks, and Rhode Island Reds entered in the five most recent contests, the average egg production during each week of the year.

The best individual egg record in the seven years of the contests was made by a white Wyandotte which laid 308 eggs during the year 1917–18. It is stated that there are only two other trap-nest records of 300 or more eggs in all the egg-laying competitions in the United States and Canada.

**Final report of the fourteenth egg-laying competition,** C. POTTS (*Queensland Agr. Jour., n. ser., 9 (1918), No. 6, pp. 213–225, figs. 10*).—This is a report on the annual Queensland Agricultural College egg-laying contest which closed March 31, 1918, and covers the same general ground as the report of the preceding contest already noted (E. S. R., 38, p. 173). A group of 6 birds was entered by each of 73 competitors. The egg records by months of each group and the annual production of the individual hens in 20 of the groups where the birds were housed separately are tabulated. The records by months of the latter hens may be found in the sucessive monthly issues of the *Journal* during the progress of the competition. The average weights per egg of the eggs laid in each group pen and by each single test hen are also recorded.

The average egg production was the lowest obtained during the 14 years of the contests, due partly to cold weather and excessive rainfall in the spring and partly to poor quality of the available feeding stuffs. It is stated that a good grade of shorts was unprocurable. The highest individual record was made, however, in the course of this contest, 334 eggs having been laid by a Black Orpington. Her eggs averaged 1.75 oz. per egg, which was below the minimum required for a prize.

**Final report of the fifteenth egg-laying competition, Queensland Agricultural College** (*Queensland Agr. Jour., 11 (1919), No. 5, pp. 183–194*).—This contest was concluded March 31, 1919. The number of hens entered was 390, of which 240 were single tested. The records are tabulated as noted above for the preceding contest. Drought, a poor grade of wheat, and an unavoidable lack of green feed reduced the number of eggs secured and their average weight below what was expected on the basis of past performance.

**A convenient method of indicating the time element in giving a hen's record,** H. D. GOODALE (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1919), No. 5, p. 37*).—As a compact expression for a pullet's egg production from the date of first egg to the pause in egg laying during the second summer or fall, the author suggests a symbolic fraction with the number of eggs as the numerator and the number of days in the period as the denominator.

**Fertility experiments**, B. F. KAUPP (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1919), No. 7, pp. 53, 54*).—The cocks were removed from flocks of hens (13 different varieties) at the North Carolina Experiment Station. Egg fertility remained approximately normal for three days and then dropped steadily. No fertile eggs were secured after the eleventh day. When the cocks were returned, normal fertility was attained after five days. The detailed records of the White Leghorn flock are tabulated.

**The results of single, one-day matings**, J. H. MARTIN and W. S. ANDERSON (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1918), No. 3, pp. 22, 23*).—A vigorous Single Comb White Leghorn cock was allowed to tread 34 hens in less than 9 hours. The hens had all been isolated from males for some time. Ten of the matings led to fertile eggs. The shortest interval between mating and the appearance of fertilized eggs was 29 hours 23 minutes. The longest interval was 6 days.

**Note on the behavior of capons when brooding chicks**, H. D. GOODALE (*Jour. Anim. Behavior, 6 (1916), No. 4, pp. 319–324*).—The brooding habits of 2 Rhode Island Red and 3 Brown Leghorn capons at the Massachusetts Experiment Station are described.

Both kinds cared for young chicks satisfactorily, led them about, scratched up feed for them, and called them by clucking. The marked differences between the two breeds with respect to the broodiness of hens was not reflected in the behavior of these capons, in fact the Leghorn capons were perhaps better caretakers than the Rhode Island Reds.

"Obviously, until more studies have been made of the behavior of fowls, the brooding instinct of the capon can not be cited as proof of the assumption of a female secondary sexual character by a castrated male."

**Concerning artificial lighting**, G. R. SHOUP (*Washington Sta., West Wash. Sta., Mo. Bul., 7 (1919), No. 7, pp. 106–110*).—Advice is given as to the handling of a poultry flock when artificial illumination is used in winter to increase egg production.

**Cottonseed hulls, a sanitary and vermin-proof litter for poultry**, M. B. TABENHAUS (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1918), No. 3, pp. 23, 24*).—The following advantages are claimed for cottonseed hulls as a litter in poultry houses: (1) Little dust is produced, (2) moisture does not penetrate it easily, and (3) droppings become covered with small particles of hulls and thus do not decompose readily and are not flattened out on the floor. The author's observations were made in Texas.

## DAIRY FARMING—DAIRYING.

**Calf feeding experiments: Corn silage; whole milk dilutions**, G. C. WHITE and J. A. KUELLING (*Connecticut Storrs Sta. Bul. 102 (1919), pp. 91–136*).—To study (1) the desirability of introducing corn silage into the ration of dairy calves early in life, (2) the results of substituting whole milk diluted with water for skim milk, and (3) the feeding of a commercial calf meal in conjunction with silage, 32 calves (dairy breeds, males and females) divided into 10 groups were put on experiment with the intention of feeding them for 180 days. The calves were mostly a week or so old when the experiments began. Those that were to get the silage were allowed it as soon as they would eat it. All calves received undiluted whole milk for the first 2 to 4 weeks according to circumstances. The normal amount of skim or diluted milk given daily was 14 lbs. per head. The following tabulation gives the details of the feeding

and growth of the calves in the groups which were carried through the full period, except the calf-meal group:

*Results from feeding silage or diluted whole milk or both to dairy calves from shortly after birth until about the age of 6 months.*

| Group number. | Water in the whole milk. | Number of calves completing test. | Average initial weight. | Feed consumed per head in 180 days. | | | | | Average gain per head. | | Dry matter consumed per pound of gain. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Grain. | Hay. | Silage. | Whole milk +water. | Skim milk. | In 180 days. | Per day. | |
| | *Per cent.* | | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* | *Lbs.* |
| 1 | None. | 3 | 77 | 254 | 304 | 237 | 107 | 2,115 | 240 | 1.33 | 3.26 |
| 2 | None. | 2 | 77 | ..... | ..... | 937 | 64 | 2,095 | 138 | .77 | 3.35 |
| 3 | None. | 4 | 75 | 231 | 272 | ..... | 73 | 2,067 | 224 | 1.25 | 2.96 |
| 4 | 54 | 2 | 74 | 245 | 297 | ..... | 1,025 | ..... | 196 | 1.09 | 3.19 |
| 5 | None. | 3 | 87 | [1] 157 | [1] 91 | 684 | 179 | 2,199 | 238 | 1.32 | 2.80 |
| 8 | 75 | 3 | 81 | 283 | 326 | ..... | 793 | ..... | 190 | 1.06 | 3.43 |
| 10 | 75 | 3 | 90 | 291 | 211 | 807 | 738 | ..... | 214 | 1.19 | 3.55 |

[1] Limited.

Groups 1 to 4 were begun in May, 1915, and the others in 1916. The grain mixture in 1915 consisted of corn meal, crushed oats, and wheat bran (2:2:1). Group 5 received the same except that "hominy" was substituted for corn meal. "Hominy," ground oats, red dog, and blood meal (3:3:1:1) constituted the grain mixture given to groups 8 and 10. The blood meal was added because of the great dilution of milk in these groups compared with group 4. In the case of group 10, 2.5 parts of linseed meal replaced the one part of blood meal for 35 days toward the end of the experiment. The hay was composed of mixed grasses with some clover or alfalfa. The milk used in the dilutions contained about 5 per cent fat. The silage fed most of the time contained over 75 per cent moisture. Proximate analyses of 8 samples of silage are reported. Costs are computed on a 1915–1916 and on a December, 1917, basis of prices.

More or less scouring occurred in practically all groups, and it was particularly noticeable in group 2 which received silage, but no grain or hay. Feeding silage before the age of 2 or 3 months is not considered desirable because it widens the ration and increases the chance of scouring. In the later months the calves relished the silage, and often ate it before drinking their skim milk.

"The diluted whole milk groups proved more expensive than the skim milk groups, but gains were produced at a price low enough so that such a practice would prove practical on a whole milk market farm, since it eliminates the investment in a separator and the labor involved in separation." Of the diluted milk groups, group 10 (which also received silage) was the most satisfactory from the standpoint of gains and costs. Group 7 (diluted milk) was not continued on experiment because some of the feeds desired were not available. Group 9 consisted of 2 calves fed diluted milk in which some of the grain was mixed. The calves scoured badly and the experiment was discontinued. The ill-success is attributed in part to the method of feeding. "The usual coagulation by the rennin is probably interfered with."

The calves of group 6 received a proprietary calf meal with silage, grain and hay. After a few weeks all whole milk was withdrawn. No skim milk was fed. Four calves started and 2 completed the test. The average gains of the latter were 0.91 and 0.73 lbs. per day, respectively. Digestion troubles were encountered. Silage and calf meal is not considered a desirable mixture for young calves.

**The feeding of oats to calves**, J. HANLY (*Dept. Agr. and Tech. Instr. Ireland Jour., 18 (1918), No. 3, pp. 306, 307*).—The results of 6 different tests involving 42 calves, in which half the calves were fed crushed oats and the other half a prepared meal (corn meal, oat meal, and crushed flaxseed, 2:2:1), are summarized. Both groups received skim milk or buttermilk. The average daily gains per calf were 1.47 lbs. for the oats-fed lots and 1.39 lbs. for the meal-fed lots. In these experiments the meal was not steeped or cooked as in those previously noted (E. S. R., 37, p. 873). Like the oats it was mixed directly with the milk at the time of feeding.

A single test comparing whole oats with uncooked meal, each mixed with separator skim milk, is also reported. Throughout the trial, which lasted 127 days, the calves were grazed together on "medium pasture." The calves were 4 to 5 weeks old at the start and averaged 105 lbs. in weight. The average daily gain of the three oats-fed calves was 1.63 lbs. and of the three meal-fed calves 1.48 lbs.

**A study of the relative reliability of official tests of dairy cows**, W. W. YAPP (*Illinois Sta. Bul. 215, abs. (1919), pp. 4, figs. 3*).—The complete edition of this bulletin has been noted (E. S. R., 40, p. 773).

**Dairying industry**, J. C. J. COOPE (*Rhodesia Munitions and Resources Com. Rpt. 1918, pp. 30–35*).—Butter making in Rhodesia and the relation of dairy farming to soil fertility are discussed.

**A system of Cheddar cheese manufacture suitable for Rhodesian farm conditions**, J. C. J. COOPE (*Rhodesia Munitions and Resources Com. Rpt. 1918, pp. 26–29, 29a, 29b*).—The Cheddar cheese process is considered the only one adapted to the warm climate of Rhodesia. The process of making cheese of the Cheddar type from whole milk under somewhat primitive farm conditions is outlined.

**A study of the eye formation of Emmental cheese**, W. M. CLARK (*Centbl. Bakt. [etc.], 2. Abt., 47 (1917), No. 10–15, pp. 230–244, figs. 2*).—Previously noted from another source (E. S. R., 37, p. 875).

## VETERINARY MEDICINE.

**Annual report for 1918 of the principal of the Royal Veterinary College**, J. MCFADYEAN (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 229–240, figs. 3*).—This report deals with the occurrence of diseases of live stock during the year, including anthrax, glanders, sheep scab, hog cholera, foot-and-mouth disease, rabies, parasitic mange in horses, and abortion in mares.

**The fifth and sixth reports of the director of veterinary research**, A. THEILER (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6 (1918), pp. 812, figs. 72*).—The papers here presented in these, the usual reports (E. S. R., 35, p. 678), are as follows: Acute Liver Atrophy and Parenchymatous Hepatitis in Horses, by A. Theiler (pp. 9–164); Itestinal Invagination, Intussusception, in Sheep (Reckziekte or Knopderm) (pp. 165–186) and The Occurrence of Dourine (Slapziekte) in South Africa, both by J. Walker (pp. 187–206); Anthrax in South Africa, by D. Kehoe (pp. 207–253); Investigations into Lamziekte in Cattle (pp. 255–320) and Preliminary Report on the Harmful Effects of "Steek" Grass on the General Health and Condition of Sheep (pp. 321–333), both by P. R. Viljoen; Contagious Abortion of Cattle in South Africa, by E. M. Robinson (pp. 335–373); Chemotherapy of Haemonchosis in Sheep, by F. Veglia (pp. 375–482); The Fate of Ingested and Injected Arsenic in Sheep, with Special Reference to Treatment of Haemonchosis (pp. 483–538) and The Microtitration of Arsenic (pp. 539–550), both by H. H. Green; The Effects of Arsenite of Soda Dipping Fluids on Working Oxen, by D. T. Mitchell (pp. 551–

591); Isolation and Description of a Bacterium Causing Oxidation of Arsenite to Arsenate in Cattle Dipping Baths (pp. 593–610) and Description of a Bacterium, Isolated from a Cattle Dipping Tank, which Reduces Arsenate to Arsenite (pp. 611–624), both by H. H. Green; Notes on the Species of Gastrophilus Found in South Africa, by G. A. H. Bedford (pp. 625–648); Notes on the Intoxication by Gastrophilus Larvæ, by G. van de W. de Kock (pp. 649–694); A New Nematode in Fowls, Having a Termite as an Intermediary Host [*Filaria gallinarum* n. sp.], by A. Theiler (pp. 695–707); Anoplura from South African Hosts (pp. 709–736) and New Culicine Larvæ from the Transvaal (pp. 737–749), both by G. A. H. Bedford; and The Deficiency Aspect of Maize Products (pp. 751–774) and Upon the Quantitative Relationship between the Antineuritic Value of a Diet and the Onset of Polyneuritis (pp. 775–812), both by H. H. Green.

**Report of the civil veterinary department, Assam, for the year 1918–19,** W. Harris (*Rpt. Civ. Vet. Dept. Assam, 1918–19, pp. 2+15+2*).—The usual report (E. S. R., 40, p. 380).

**Annual report of the civil veterinary department, United Provinces, for the year ending March 31, 1919,** E. W. Oliver (*Ann. Rpt. Civ. Vet. Dept. United Provs., 1919, pp. [6]+19*).—The usual report (E. S. R., 40, p. 284).

**A manual of bacteriology,** R. T. Hewlett (*London: J. & A. Churchill, 1918, 6. ed., pp. X+769, pls. 31, figs. 69*).—In the present edition of this manual of bacteriology, an earlier edition of which has been previously noted (E. S. R., 14, p. 491), the text has been revised throughout and much new material has been introduced, including considerable additions to the sections dealing with anaphylaxis, agglutination, and immunity. The chapter dealing with anaerobic organisms has been enlarged to include an account of the relation of this group of organisms to war injuries.

**Heterolysins, II,** A. Sordelli and G. Fischer (*Rev. Inst. Bact. [Argentina], 2 (1919), No. 2, pp. 201–210*).—Continuing the investigation previously noted (E. S. R., 40, p. 578), the authors have found heterolysins in the organs of the wild and domesticated guinea pigs and in guinea pig and chicken sarcomata. Rat sarcomata and carcinomata did not contain heterolysins.

**The influence of desiccation on certain normal immune bodies,** H. T. Karsner and K. R. Collins (*Jour. Infect. Diseases, 25 (1919), No. 5, pp. 427–432*).—A comparative study is reported of the effects on the normal antibodies in the blood of horses and goats of drying in the air, or in vacuo over sulphuric acid at room temperature, and freezing and drying over sulphuric acid in vacuo. The results obtained are summarized as follows:

"The normal antibodies in the serum of the horse and goat are gradually decreased by drying. The agglutinins and hemagglutinins are less affected by drying if the serum is frozen while desiccation is going on. The loss of titer in the nondialyzed serum takes place within the first ten days, while it is delayed in the dialyzed serum until after the twentieth day. The decrease of agglutinins in the dialyzed serum is uniform for all methods of drying until after two months, while in the nondialyzed serum the loss is greater in the serum that was not frozen and still greater in the serum dried in the air. The pH of dried serum is slightly greater than in the original serum, and as the loss of agglutinins becomes greater the difference is more marked. Dried serum dissolved and dried again shows definite changes in the formation of crystals."

**Notes concerning the concentration of antitoxic sera.** A. Sordelli (*Rev. Inst. Bact. [Argentina], 2 (1919), No. 2, pp. 211–214*).—The author reports excellent results obtained in the concentration of antitoxic sera by the Homer method previously noted (E. S. R., 40, p. 287). Concentrations of the plasma

to one-fifth the original volume have been obtained which filtered easily, contained relatively little protein, and represented a loss of material not exceeding 10 per cent.

**The production of antiserum for agglutination tests**, F. H. K. Reynolds and J. F. Hill (*Jour. Infect. Diseases, 25 (1919), No. 5, pp. 412, 413*).—The authors have found that washing in sterile salt solution the killed suspensions of bacteria which are used for the production of immune serum rids the suspensions of certain toxic materials and facilitates the production of antiserum.

**Phenolut, a colloidal cresol solution as a disinfectant**, W. Schürmann (*Ztschr. Hyg. u. Infektionskrank., 84 (1917), No. 1, pp. 14–32*).—The author describes a new colloidal cresol preparation "phenolut" which is said to contain no soap or resin, to have a cresol content of 40 per cent, and to form a clear 4 per cent solution in water. Tests of the comparative value of phenolut and lysol as disinfectants are reported, which indicate that the phenolut is as powerful a disinfectant as lysol.

**Anaplasma marginale.—Jolly bodies in anemic blood; anaplasmatic forms of piroplasms**, G. Di Domizio (*Clin. Vet. [Milan], Rass. Polizia Sanit. e Ig., 42 (1919), Nos. 7, pp. 203–220, figs. 2; 8, pp. 237–251; 9–10, pp. 292–311, pls. 2; abs. in Trop. Vet. Bul., 7 (1919), No. 3, pp. 152–155, pl. 1*).—The author's conclusions are as follows:

"There exists among goats in the colony of Eritrea an intracorpuscular blood parasite which in all probability represents a species belonging to the genus Anaplasma (*A. ovis*). The researches and observations upon which various authors have based doubts upon the parasitic nature of anaplasms have maintained that they were nuclear fragments (Jolly bodies) or, on the other hand, stages in the life cycle of some piroplasms, do not detract from the value of Theiler's and Lignières's experiments, which demonstrated the existence of a new genus of parasite named by Theiler Anaplasma.

"The morphology described as characteristic of *A. marginale* (and its variety *centrale*) and of *A. argentinum*, as described by Theiler and Lignières, is distinguishable from that of the Jolly bodies found in anemic blood. The considerably higher percentage of the red corpuscles invaded with marginal points is of especial importance in this connection. These anaplasms are also distinguishable from the so-called anaplasm-like forms of piroplasms, inasmuch as a greater percentage of corpuscles is invaded with marginal points, and these points are quite spherical in form and each has sharply defined borders.

"Some authors in descriptions of alleged marginal points, examined singly, have pictured them as having irregular and indistinct borders (like those of the anaplasm-like forms of piroplasms), but the general aspect of true anaplasms leaves no room for doubt.

"Although Anaplasma has only been observed as a well-defined entity among bovines in South Africa and Argentina, the collective observations and researches of many authors appear to show that (a) these bodies exist not only in bovines but also in other animals, (b) very probably there exist several species or varieties of anaplasms not only in various species of animals but also in the same species of animal, (c) these various species or varieties, although conforming morphologically with typical Anaplasma, present slight differences in form."

A list of 58 references is appended.

**The antigen of Bacillus anthracis**, C. C. Warden and J. T. Connell (*Jour. Infect. Diseases, 25 (1919), No. 5, pp. 399–411*).—Following the methods previously employed in the study of fats as antigens (E. S. R., 40, p. 676), a tentative analysis of the fatty complex of the anthrax bacillus was made which in-

dicated its composition to be approximately as follows: Caprylic acid 10, capric 25, oleic 60, and palmitic 5 per cent. A synthetic antigen prepared from the above proportions of purified acids and stabilized by the addition of a trace of egg lecithin, proved to be specific for *B. anthracis*. Guinea pigs and rabbits injected with large doses of the sterile artificial anthrax antigen regularly developed anthrax infection from anthrax spores of low virulence injected with the baled hay. Small doses of the antigen raised the resistance of the animals against infection with a highly virulent strain of anthrax organisms. Proteins isolated from anthrax bacilli did not act as antigens.

**The Australian epidemics of an acute polioencephalomyelitis (X disease)**, J. B. CLELAND, A. W. CAMPBELL, and B. BRADLEY (*Rpt. Microbiol. Lab. (Govt. Bur. Microbiol.) [N. S. Wales], 8 (1917), pp. 150–280, pls. 10*).—This paper reports investigations of a severe disease with cerebral symptoms and with a mortality of about 70 per cent, which appeared in certain districts of New South Wales in the late summer and autumn of 1917 and again a little earlier in the year 1918. Outbreaks of a similar disease have occurred in the Goulburn Valley in Victoria, in Brisbane, and in Western Queensland, and in the Townsville district.

The authors' studies have led to the conclusion that the disease is a distinct clinical entity. The virus responsible for it is evidently closely related to that causing ordinary acute poliomyelitis, but is either specifically distinct or a more recent irritant apparently breeding true. It has been conveyed by intracerebral inoculations to monkeys, sheep, a calf, and a horse, but there is no evidence of its occurring in animals or of animals acting as a reservoir of the virus, or of the disease being conveyed by an intermediate host from human being to human being. The possibility of the occurrence of an intermediate (invertebrate) host of the virus is discussed.

**Glycerinated rinderpest vaccine**, C. KAKIZAKI (*Kitasato Arch. Expt. Med. [Tokyo], 2 (1918), No. 1, pp. 59–66*).—An investigation of the immunizing power of glycerinated rinderpest vaccine, prepared from defibrinated infected blood and from an emulsion of infected spleen, is reported.

The virulence of the glycerin blood extract was destroyed by standing for 20 days at a temperature of from 18 to 22° C. and for 80 days at temperatures lower than 15°, while that of glycerinated spleen required 60 days at temperatures of from 15 to 29° and more than 90 days at lower temperatures. Double vaccination with a total amount of from 20 to 30 cc. of the vaccine proved sufficient to protect the Korean cattle employed in the experiments from further infection by virulent blood.

**Report of bacteriological investigation of tetanus carried out on behalf of the War Office Committee for the study of tetanus**, W. J. TULLOCH (*Jour. Hyg. [Cambridge], 18 (1919), No. 2, pp. 103–202, figs. 17*).—This report deals with bacterial research on tetanus along the following lines: Inquiries into the occurrence of the various types of *Bacillus tetani* in the wounds of men suffering from tetanus and of those showing no evidence of the disease; experiments in vitro to determine whether immune sera, prepared by inoculation of whole cultures into animals, contain antibodies other than agglutinins specific to the different types of the bacilli; experiments in vivo to examine the problem of infection with *B. tetani* as contrasted with intoxication due to absorption of the products of that organism; the influence which various surgical procedures exert upon infection of wounds due to anaerobic bacteria; attempts to diagnose tetanus and to determine the type of the infection by means of an agglutination reaction; a study of the possible relationship which may exist between the serological type of a tetanus bacillus and the hemagglutinating type of the individual from whom it was isolated; a discussion of two cases of abdominal

tetanus; and the results obtained in an examination of human feces to determine the prevalence of the various types of *B. tetani* in the human intestine.

From 20 per cent of wounds of men who showed no evidence of tetanus, *B. tetani* could be recovered at some period during the process of repair. Evidence was given which indicated that the serum prophylaxis in use until recently afforded more protection against Type I infections than it did against infections due to Type II or III. The experiments in vitro led to the conclusion that in whole cultures of *B. tetani* three antigens at least appear to exist: (1) The bacillary substance itself, the inoculation of which leads to the development of agglutinins which are specific to the types; (2) an antiphagocytic antigen which is present in young unfiltered cultures, but if present at all is found only in small quantity in filtrates and which evokes the development of "opsonins" which are specific to the types; and (3) a spasm-producing toxin, an antigen which is filterable and which in laboratory animals, at least, does not appear to be specific to the types. "These findings suggest that improvement might be looked for in serum prophylaxis and serum therapeutics from the employment of sera possessing antibacterial as well as antitoxic properties."

The experiments in vivo led to the following conclusions:

The toxin of *B. welchii* and to a less extent that of *Vibrion septique* when used in sublethal doses produce sufficient devitalization of tissue to allow of the development of tetanus infection. Antitoxins to the products of these organisms protect animals against infection with *B. tetani* when such products are used as tissue debilitants.

The protection afforded by tetanus antitoxin can only be partial. The nature of the substance used to produce devitalization of tissues exerts a profound influence upon the development of tetanus spores in the tissues. Certain other relationships, the nature of which is at present not determined, appear to depress the infectivity or toxogenicity of certain strains of *B. tetani*. The experiments suggest, but do not prove, that while monovalent antitoxic sera exert no specific neutralizing influence on the spasm-producing toxin of any one type of tetanus they may exert a specific anti-infective influence. Equivocal results were obtained in the investigation of the relative value of antitoxic and antibacterial sera.

The antiseptic dressings examined were found to exert but little influence upon the anaerobic flora of wounds, but excision of the wound area, irrespective of the dressings employed in the treatment, exerted a beneficient influence.

It was found impossible to use the agglutination test as an aid to the diagnosis of tetanus, and no relationship was found to exist between the serological type of *B. tetanus* and the hemagglutinating type of the individual from whom it was isolated.

**The growth of Bacillus tetani in the presence of tuberculin**, F. Marino (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 22, pp. 821–824, 831, 832*).—Three papers are presented.

I. *Method for the determination of tuberculin* (pp. 821, 822).—A method for the quantitative determination of tuberculin is described which depends upon the fact that *B. tetani* is very sensitive to tuberculin. The details of the process are as follows:

The culture to be tested is filtered, 10 cc. of the filtrate is inoculated with *B. tetani*, and the air in the tube exhausted. If the tetanus bacillus does not grow, the filtrate contains at least 1 mg. of tuberculin per cubic centimeter of the liquid. Under these conditions the exact strength of the tuberculin can be determined by putting in 10 test tubes gradually increasing amounts of from 1 to 10 cc. of the filtrate, making up the volume to 10 cc. with ordinary bouillon,

and inoculating each tube with *B. tetani* and evacuating as before. The strength of the tuberculin can be calculated from the amount used in the first tube in which no growth takes place.

II. *Determination of the antitoxic power of antituberculous serums* (pp. 823, 824).—Using the method noted above for determining the strength of tuberculin, it was found that normal and antituberculous serums in general neutralize tuberculin to the same degree, but that occasionally the normal serum has a stronger neutralizing power than the specific serum. Three theories are suggested to account for this: (1) The antituberculous serum may contain free tuberculin, (2) the organism of immunized animals is weakened by injections of tuberculous cultures and no longer has the power of forming the same quantity of diastases as do normal animals, and (3) the organism under the prolonged toxic action of tuberculous cultures produces substances which have the property of weakening the diastases which attack and transform tuberculin.

III. [*Comparison of human, bovine, and equine tubercle bacilli*] (pp. 831, 832).—The amount of tuberculin in cultures of human and bovine tubercle bacilli was found by the tetanus bacillus test to be greater than that in cultures of the corresponding equine bacilli. The repeated passage of the equine bacilli through rabbits renders it as virulent and of as high a tuberculin content as human and bovine tubercle bacilli.

The author concludes that the tuberculin strength is always proportional to the virulence of the tubercle bacilli, and that human, bovine, and equine tubercle bacilli do not constitute different races of bacilli but different species of bacilli belonging to the same race.

**Methods of detecting tuberculosis in cattle**, J. J. Lintner (*Creamery and Milk Plant Mo., 8 (1919), No. 5, pp. 36, 37*).

**Accredited herds**, F. Torrance (*Agr. Gaz. Canada, 6 (1919), No. 11, pp. 953, 954*).—The author presents regulations for the establishment and maintenance of tuberculosis-free accredited herds of cattle as fixed by an Order in Council dated September 20, 1919.

**Bovine "aphticelle,"** Bédel (*Rev. Gén. Méd. Vét., 28 (1919), No. 325, pp. 12–17*).—The author describes an affection of cattle from the evacuated district of France which differs from foot-and-mouth disease and is thought to represent a new disease.

**Cattle fever ticks and methods of eradication**, W. P. Ellenberger and R. M. Chapin (*U. S. Dept. Agr., Farmers' Bul. 1057 (1919), pp. 32, figs. 5*).—The first part of this publication (pp. 3–21), which deals with tick eradication, its progress and importance, life history of the tick, and methods of eradication, is based upon Farmers' Bulletin 498 by Graybill (E. S. R., 27, p. 579) and Bureau of Animal Industry Circular 207 by Graybill and Ellenberger (E. S. R., 28, p. 181), which it supersedes. The second part (pp. 21–32) contains information on arsenical dips by Chapin, and supersedes Farmers' Bulletin 603 (E. S. R., 31, p. 776) by the same author.

**An epizootic caused by trypanosomes in cattle in French Guiana**, M. Leger and M. Vienne (*Bul. Soc. Path. Exot., 12 (1919), No. 5, pp. 258–266; abs. in Rev. Appl. Ent., Ser. B., 7 (1919), No. 9, p. 137*).—The authors conclude that the trypanosome which infects cattle in the natural state, and cattle only, in French Guiana, is a new species for which the name *Trypanosoma guyanense* is proposed.

**On the life history of the lungworm, Dictyocaulus filaria, in sheep**, J. E. Guberlet (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 6, pp. 621–627*).—This is a preliminary report of investigations conducted at the Oklahoma Experiment Station, in which the present status of knowledge of the parasite is reviewed.

**The relative potency of tail bled and carotid bled antihog cholera serum,** E. A. CAHILL (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 2, pp. 177–185*).—This is the report of an investigation of the relative value as determined by potency tests of the following methods of bleeding for hog cholera serum: (1) Carotid bleeding preceded by 3 tail bleedings 7 days apart, all within a period of 38 days from the date of hyperimmunization; (2) carotid bleeding preceded by one tail bleeding 7 days apart, both bleedings within 17 to 21 days from the date of hyperimmunization; (3) carotid bleeding only in from 10 to 14 days after the date of hyperimmunization; and (4) tail bleeding 3 or 4 times within 38 days, after which the animals are injected with more antigen and subjected to a second series of bleedings.

The potency tests, which were conducted as prescribed by the Bureau of Animal Industry, U. S. Department of Agriculture, for the testing of hog cholera serum, indicated that there is apparently no difference in the relative potency of hog cholera serum obtained from any of the four bleedings described above, and that "the circulating blood of hogs properly hyperimmunized against hog cholera retains its potency without the injection of additional antigen for at least 38 days regardless of whether the animal is bled one, two, three, or four times."

**The present status of hog cholera control,** A. EICHHORN (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 1, pp. 51–59; also in Amer. Jour. Vet. Med., 14 (1919), No. 9, pp. 465–470*).—This is a general discussion of hog cholera, its relation to other diseases of hogs, and measures for its control.

It is emphasized that while lesions produced by other organisms are now occurring with greater frequency in hogs, an effective and successful control of hog cholera would result in a very pronounced decrease in other infections. Vaccination, with a clear sterilized serum and virus free from all possible contamination, is considered by the author to be the foundation of the control of hog cholera.

**An estimate of the number of cysts in a case of pork measles,** M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 1, pp. 71, 72*).—This is a brief account of a case of pork cysticercosis found in a young animal at the abattoir at Rosslyn, Va. The carcass, which with head and viscera removed weighed 56 lbs., was estimated to contain 190,470 cysts.

**Horse sickness in the Belgian Kongo,** R. VAN SACEGHEM (*Bul. Soc. Path. Exot., 11 (1918), No. 5, pp. 423–432; abs. in Internatl. Inst. Agr. [Rome], Internatl. Rev. Sci. and Pract. Agr., 10 (1919), No. 1, p. 80*).—The author found that "heartwater of sheep produces horse sickness but can not be transmitted to cattle. The virus of horse sickness gives feverish reactions in goats and sheep. The virus of horse sickness and that of heartwater appear to be two varieties of the same virus. Horse sickness was propagated at Sambi especially by Culicoides and Tabanus."

**Joint-ill and its treatment with serum from the blood of the mother,** MANN (*Ztschr. Veterinärk., 29 (1917), No. 3, pp. 65–81*).—The author reports excellent results obtained in the treatment of joint-ill of foals with blood serum from the mother, and even better results in the use of the serum as a means of immunizing foals against the disease. As an immunizing agent the serum was injected intravenously in amounts of from 400 to 500 cc. or, if the animal was very restive, from 250 to 300 cc. was injected intravenously and a like amount subcutaneously in both sides of the neck.

Tables are given of 36 cases of joint-ill treated with serum and of 12 cases in which the serum was used for producing immunization. In the former 86.4 per cent of the animals recovered and in the latter there was no loss or injury,

the disease developing in only 8.3 per cent of the cases and then in a light form which was cured in a short time.

**The treatment of sarcoptic mange in the horse**, M. A. VAN DEN ECKHOUT (*Ann. Méd. Vét., 64 (1919), No. 3–4, pp. 112–115; abs. in Rev. Appl. Ent., Ser. B, 7 (1919), No. 8, p. 136*).—In treating this parasite the author recommends the application of an ointment consisting of carbonate of soda, water, brown soap, sulphur, and creolin one part by volume of each. This is rubbed in by means of a hard brush so as to penetrate through the skin into the burrows, each treatment to continue for about 30 minutes, after which the horse should be well washed down with clean water and dried. The treatment should be repeated four times with intervals of 3 to 4 days.

**Bacillary white diarrhea of young chicks.—VII, Ovarian infection of the adult fowl and transmission of the disease through the oviduct**, L. F. RETTGER, W. F. KIRKPATRICK, and L. E. CARD (*Connecticut Storrs Sta. Bul. 101 (1919), pp. 73–88*).—In continuation of the investigation of bacillary white diarrhea previously noted (E. S. R., 37, p. 383), the problem of the prevention of the continued spread of ovarian infection through the breeding stock has been considered in the present study.

To determine whether the introduction of the organism of bacillary white diarrhea into the cloaca and oviduct of laying hens may lead to permanent ovarian infection, and to demonstrate whether the male plays the important rôle of transmitting the infection from infected to hitherto sound hens, two sets of experiments were conducted with adult fowls which had previously been found to be free from *Bacterium pullorum* infection. In the first experiment four groups of 18 well-matured Rhode Island Red pullets were housed permanently in separate thoroughly disinfected houses and treated as follows: One lot serving as check was left uninfected, while the other three lots consisted of 9 hens artificially infected, and 9 uninfected, one without male and the other two with males. The infection was produced by oviduct injections of from 0.5 to 1 cc. of a 24 to 48 hour broth culture of *B. pullorum*. A second inoculation of the same individuals was made one month later, following which three sets of agglutination tests were made. The birds were killed and examined five months after the first inoculation.

The second series of experiments was conducted along similar lines, three sets of 20 White Leghorn hens each being used, a check lot uninoculated, and two lots consisting of half inoculated and half uninoculated, one set without male and one with male added late in the experiment. The inoculation was made with a culture of *B. pullorum* similar to that of the first experiment but in this case diluted with an equal volume of physiological salt solution before measurement.

In the first series, practically all of the infected hens reacted promptly to the agglutination test, while with a single exception, none of the untreated lot reacted. In the second series, while the percentage of positive reactors was smaller than in the first, the relative number of permanently infected hens was much larger. The negative results of the agglutination tests and ovarian examination of hens of the check lot and of those associated with the inoculated hens are considered of significance as indicating that transmission of infection from hen to hen through infected litters and by ordinary association is rare. No definite conclusions could be drawn concerning the part played by the male in the transmission of the infected organism, but it is thought that this method of transmission can no longer be doubted.

In conclusion the authors advise that "as a practical means of preventing the spread of *B. pullorum* infection from hen to hen, and thus making the

disease as it affects adults stationary within the flock, males should not be allowed to run with the females except during the breeding season. The adoption of this policy can work no injury, and may contribute very much to the ultimate elimination of bacillary white diarrhea. A trial period of a year or two should suffice to enable us to determine the full value of the plan."

**The chicken pox, roup, and canker problem in New Jersey**, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 7 (1919), No. 11, pp. 4*).—The author discusses the status of these diseases in flocks in New Jersey, together with symptoms, effects, causes, treatment, and prevention.

**On the life history of the chicken cestode, Hymenolepis carioca**, J. E. GUBERLET (*Jour. Parasitol., 6 (1919), No. 1, pp. 35–38, pl. 1*).—This is a report of studies conducted at the Oklahoma Experiment Station in continuation of work previously noted (E. S. R., 35, p. 577).

The work has demonstrated experimentally that the stable fly may transmit this tapeworm (*H. carioca*) to chicks. "This thread-like worm, according to the above observations, seemed to be most numerous during the late summer and fall at the seasons of the year when *Stomoxys calcitrans* are very abundant. During the autumn this species of fly is less active, and consequently is more easily taken by chickens. Experimentally infesting chicks with *H. carioca* through feeding infested stable flies *S. calcitrans* under control conditions makes it evident that this species of fly may be the intermediate host of this species of chicken cestode." It is pointed out that three other of the six species of fowl tapeworms found in the United States have been demonstrated experimentally to be thus transmitted to chickens, namely, *D. proglottina* through the slug *Limax cinerus* by Grassi and Rovelli; *Choanotaenia infundibuliformis* through the common house fly by the author; and *D. cesticillus*, which has the house fly as its intermediate host, by Ackert, in 1918.

**On the life history of Davainea tetragona, a fowl tapeworm**, J. E. ACKERT (*Jour. Parasitol., 6 (1919), No. 1, pp. 28–34*).—This is a report of studies conducted at the Kansas Experiment Station in continuation of previous work (E. S. R., 41, p. 685).

Flies that had been trapped in poultry yards infested with *D. tetragona* and other tapeworms were fed, many of them alive, to young chicks reared in a screened house. At the end of two months an examination of the chicks showed three to contain mature tapeworms, several with embryos. In 12 control chicks, the feed of which was free from animal tissue, no parasitic worms were found.

"Flies eat both onchospheres and egg masses of *D. tetragona*, and neither when ingested are lost by regurgitation or passed through the digestive tract unaltered. As common house flies from infected poultry yards constituted the only difference between the food given to the experimental chicks and that fed to the control chicks, evidently *D. tetragona* may be transmitted from one fowl to another by *M. domestica*."

## RURAL ENGINEERING.

**Geology and ground waters of the western part of San Diego County, Cal.**, A. J. ELLIS and C. H. LEE (*U. S. Geol. Survey, Water-Supply Paper 446 (1919), pp. 321, pls. 47, figs. 18*).—This report, prepared in cooperation with the State of California and the city of San Diego, deals with the geology and ground waters of that part of San Diego County, Cal., which is drained directly into the Pacific Ocean, and embraces an area of about 3,000 square miles.

The area consists of a mountainous highland area and a narrow belt along the shore characterized by broad, flat-topped sea terraces. The soil of all the

valleys is composed of sand and silt derived mainly from the granite rocks of the highland area. In general, the water table in the major valleys has the slope and, to some extent, the form of the ground surface, although important differences exist. Observations on 122 wells showed four types of annual fluctuation of water table varying from an average of 7 to an average of 1.5 ft.

Tests of several wells are reported which show in general the dependence of yield on the character and thickness of the water-bearing material. "The specific capacity of the wells tested ranged from 6 to 45 gal. per minute per foot of drawdown. The smallest and largest yields were obtained from wells . . . only about two miles apart and which draw their water from gravels that are similar in character and thickness. . . . The tests indicate that wells sunk in the major valleys of San Diego County, penetrating a considerable depth of coarse sand or from 10 to 15 ft. of open gravel, such as lies at the bottom of the ancient river valleys, if properly perforated or equipped with strainers, may be expected to yield at least 20 gal. per minute per foot of drawdown."

The minor valleys of the coastal belt seldom exceed in area a few hundred acres. They are underlain and bordered by sedimentary rocks, and contain alluvium and other fill in their lower but not in their upper parts. The water table "lies farther beneath the surface than in the major valleys. In general shape and position, however, it corresponds to that in the major valleys, having little slope across the valleys but an appreciable slope downstream. Its fluctations within each year are similar to those in the major valleys of the coastal belt but of wider range. . . .

"The quantity of ground water available in the minor valleys of the coastal belt is small, owing to the narrow width and shallow depth of the fill and the small run-off and short period of flow of the streams that traverse the valleys. Supplies adequate for domestic use can, however, be obtained in most of them. The safe yield of most of the wells is very small, because the run-off in dry years is almost negligible. The use of ground water for irrigation in these valleys must as a rule be restricted to lands on the floors of the valleys, but even with this restriction, the supply in many places will be insufficient to serve all the overlying land, particularly in dry years."

In the highland area the yield of wells in residuum or decomposed granite has been found to range from very small quantities to as much as 150 gal. per minute. "The largest yields are obtained from wells that penetrate residuum of considerable depth, that are provided with lateral tunnels and auger holes, and that are situated in valleys irrigated with water from an outside source. In general, it may be said that the specific capacity of the best wells in residuum is about 8 gal. a minute per foot of drawdown, that for many wells it is as low as 1 gal. per minute per foot of drawdown, and that for the poorest wells it is much less than 1 gal."

Analyses of waters from the three different sources in the area show "a wide range in mineral content in the waters within each of the three groups, and the average mineral content in all of them is rather high. . . . Rather highly mineralized sodium-chlorid waters, fairly satisfactory for use for domestic supplies and for irrigation, and very bad for use in boilers, are greatly predominant in San Diego County and may be regarded as typical for the area."

Tests of a number of pumping plants are also reported. "Centrifugal pumps ranged in efficiency from 34 per cent for a 3½-in. pump to 76.5 per cent for a 6-in. pump, the efficiency increasing, other things being equal, with the size of the pump." Plant efficiency ranged from 26 per cent to 68.5 per cent, the smaller plants being the less efficient. The annual cost per acre-foot for the

plants tested ranged from $3.86 for a plant having a lift of 44.5 ft. and a discharge of 120 gal. per minute to $14.69 for a plant having a lift of 97 ft. and a discharge of 116.5 gal. per minute.

Other general information bearing on the subject is given.

**Surface water supply of Hawaii, July 1, 1917, to June 30, 1918** (*U. S. Geol. Survey, Water-Supply Paper 485 (1919), pp. 172*).—This report, prepared in cooperation with the Territory of Hawaii contains the results of measurements of flow of certain streams and ditches and records of rainfall in the Territory of Hawaii, made during the year ended June 30, 1918.

**Surface water supply of the lower Mississippi River Basin, 1917** (*U. S. Geol. Survey, Water-Supply Paper 457 (1919), pp. 35+XXXII, pls. 2*).—This report presents the results of measurements of flow made on the Arkansas and Red River Basins during the year ended September 30, 1917. An appendix of gauging stations and publications relating to water resources is included.

**Departures in canal design and location effect saving**, E. N. Bryan (*Engin. News-Rec., 82 (1919), No. 1, pp. 48–50*).—The author describes methods employed on the Waterford Irrigation District in California for effecting economy in canal design and construction, including minimum excavation, greater bottom width, omission of upper levee and change of location, use of full tunnel bore, provision of wasteways for cleansing pockets, location without use of the transit, and use of mass diagrams.

**Why some irrigation canals and reservoirs leak**, A. P. Davis (*Engin. News-Rec., 80 (1918), No. 14, pp. 663–665, fig. 1*).—Experience of the U. S. Reclamation Service has shown that in numerous cases the admission of water into irrigation canals and reservoirs has disclosed the existence of subterranean cavities which cause settlements and cave-ins. Three notable examples of canal troubles and six with reservoirs are described. It is concluded that canal troubles may usually be remedied by puddling the cavities or by relocation.

"Remedies in the case of reservoirs are not so easy. Puddling is useless if the subterranean conditions are such that the seepage of water can get away and thus let the seepage continue. No reservoir in earth is of much value if it continuously seeps at the rate that water can pass vertically through puddled earth. The problem then is to avoid regions where subterranean conditions are such that the water can escape. A few rules of caution may be of value: (1) Avoid reservoirs adjacent to gypsum deposits and to limestone deposits which show evidence of caves. (2) Examine critically reservoirs in volcanic rock, as a few have failed in such locations. Coarse-grained sandstone seems to be an object of suspicion, and should be critically examined. (3) Natural depressions are treacherous and should be examined with care, and if they are near deep cañons or underlain with coarse material where water might readily escape no superficial tightness will avail to make them effective."

**Algæ growths increase value of n in Kutter's formula**, P. Taylor (*Engin. News-Rec., 81 (1918), No. 4, pp. 179–181, figs. 8*).—Studies made by the U. S. Reclamation Service during 1912 to 1916 in the Tieton Irrigation Canal lined with reinforced concrete blocks indicated that algæ growths raised the factor $n$ in Kutter's formula from 0.012 to 0.014.

**The theory of underdrainage**, W. J. Schlick (*Iowa Engin. Expt. Sta. Bul. 50 (1918), pp. 57, pl. 1, figs. 8*).—It is the purpose of this bulletin to present those principles which determine the efficiency of the operation of a well constructed underdrainage system, with particular reference to drainage conditions and requirements in the State of Iowa. "Only those phases of the whole study of soils and soil moisture that are essentially a part of drainage en-

gineering are discussed, and these are treated from a drainage standpoint. . . . Some additional matter of a more strictly drainage engineering nature has been included so as to make a more complete presentation of the principles governing the design of underdrainage systems."

**Recommendations for farm drainage**, W. J. SCHLICK (*Iowa Engin. Expt. Sta. Bul. 51 (1918), pp. 24, figs. 2*).—This bulletin is prepared for the general guidance of landowners and young drainage engineers, and is intended to give a good general knowledge of the main features of the farm drainage system.

**Limestone rock asphalt produces good mortar**, J. R. NASH (*Engin. News-Rec., 82 (1919), No. 19, p. 903*).—Tests made at the University of Texas on mortar made from a natural limestone rock asphalt showed the mortar to be strong, light, and impermeable to water under 60 lbs. pressure for 48 hours. The aggregate contained approximately 10 per cent of asphalt, the remaining 90 per cent being a comparatively soft limestone. Tests of the same aggregate in concrete were not so satisfactory.

**Saturation of concrete reduces strength and elasticity**, M. B. LAGAARD (*Engin. News-Rec., 81 (1918), No. 20, pp. 908–910, figs. 6*).—Tests conducted at the University of Minnesota are reported using 1:2:4 trap rock concrete specimens, in which it was found that moisture present in concrete as a distinctly foreign element reduced its strength and modulus of elasticity, the effect being greater on the strength. The reduction in strength due to saturation by water which has been present in concrete from the time of casting was found in some cases to be more than sufficient to overcome the increase in strength due to better curing. It is concluded that the effect of saturation must be recognized in an analysis of test data, and the possibility of the resultant weakening of the concrete must be considered in design.

**Compressing concrete increases its strength**, F. P. MCKIBBEN (*Engin. News-Rec., 81 (1918), No. 23, pp. 1031–1033, figs. 2*).—Tests conducted at Lehigh University on the comparative compressive strengths of concrete columns of 1:2:4 concrete, in which half the number of specimens were compressed during molding under loads varying from 160 to 260 lbs. per square inch, are reported.

It was found that the compressed concrete weighed about 4 per cent more per cubic foot than the uncompressed concrete. For specimens 28 days old, the average compressive strength of the compressed concrete was 51 per cent greater than that of the uncompressed concrete. The increase in strength due to compressing increased considerably as the age of the specimen increased. The stress deformation curves for the compressed concrete specimens were much more nearly straight than the corresponding curves for the ordinary concrete specimens. The ultimate compressive strength for the compressed concrete 28 days old was 2,680 lbs. per square inch. The compressive strength increased as the molding compression increased. It is concluded that the strength of concrete can be materially increased by successive compression of layers.

**Strength requirements for manilla rope** (*Engin. News-Rec., 82 (1919), No. 20, pp. 958, 959*).—Data showing the weight and strength of three-strand manilla rope, medium laid, as established by recent tests at the Bureau of Standards are reported, and are summarized in the following table:

*Weight and strength of manilla rope.*

[Figures apply to three-strand rope, medium laid. Four-strand rope may run up to 7 per cent heavier and may show 95 per cent of the tabulated strength.]

| Approximate diameter. | Circumference. | Approximate gross weight of a 1,200-ft. coil. | Maximum net weight per foot. | Minimum breaking strength. | Approximate diameter. | Circumference. | Approximate gross weight of a 1,200-ft. coil. | Maximum net weight per foot. | Minimum breaking strength. |
|---|---|---|---|---|---|---|---|---|---|
| *In.* | *In.* | *Lbs.* | *Lbs.* | *Lbs.* | *In.* | *In.* | *Lbs.* | *Lbs.* | *Lbs.* |
| 6 thd. 0.25 | 0.75 | 24 | 0.0196 | 700 | 1.3125 | 4 | 576 | 0.4703 | 14,200 |
| 9 thd. .3125 | 1 | 35 | .0286 | 1,200 | 1.375 | 4.25 | 648 | .5290 | 16,000 |
| 12 thd. .375 | 1.125 | 50 | .0408 | 1,450 | 1.5 | 4.5 | 720 | .5879 | 17,500 |
| 15 thd. .4375 | 1.25 | 66 | .0539 | 1,750 | 1.5625 | 4.75 | 810 | .6615 | 19,500 |
| 18 thd. .15625 | 1.375 | 78 | .0637 | 2,100 | 1.625 | 5 | 900 | .7348 | 21,500 |
| 21 thd. .5 | 1.5 | 90 | .0735 | 2,450 | 1.75 | 5.5 | 1,080 | .8818 | 25,500 |
| .5625 | 1.75 | 126 | .1029 | 3,150 | 2 | 6 | 1,296 | 1.059 | 30,000 |
| .625 | 2 | 160 | .1307 | 4,000 | 2.0625 | 6.5 | 1,500 | 1.225 | 34,000 |
| .75 | 2.25 | 198 | .1617 | 4,900 | 2 25 | 7 | 1,764 | 1.441 | 38,500 |
| .8125 | 2.5 | 234 | .1911 | 5,900 | 2.5 | 7.5 | 2,016 | 1.646 | 42,500 |
| .875 | 2.75 | 270 | .2205 | 7,000 | 2.625 | 8 | 2,304 | 1.881 | 49,000 |
| 1 | 3 | 324 | .2645 | 8,200 | 2.875 | 8.5 | 2,580 | 2.107 | 55,000 |
| 1.0625 | 3.25 | 378 | .3087 | 9,500 | 3 | 9 | 2,916 | 2.381 | 61,000 |
| 1.125 | 3.5 | 432 | .3528 | 11,000 | 3.125 | 9.5 | 3,240 | 2.645 | 67,000 |
| 1.25 | 3.75 | 504 | .4115 | 12,500 | 3.25 | 10 | 3,600 | 2.940 | 73,000 |

**Effect of artificial light on the growth and ripening of plants**, J. L. R. HAYDEN and C. P. STEINMETZ (*Gen. Elect. Rev., 21 (1918), No. 3, pp. 232–236, figs. 5; abs. in Sci. Abs., Sect. B—Elect. Engin., 21 (1918), No. 245, pp. 189, 190*).—An experiment in an orchid house with beans is reported, in which gas-filled Mazda lamps were used as the source of light. Five 500-watt lamps were suspended in a row 36 in. above the ground and 17 in. apart and were kept burning day and night for 44 days, consuming 2.5 kw. Two lamps were kept burning 29 days longer. The hothouse temperature was raised 2° C. by the heat of the lamps. The power consumption over the bed was 55 watts per square foot and the intensity of illumination about 700 lumens per square foot of ground, thus approaching direct sunlight.

The rate of plant growth and development was nearly doubled over the plat receiving only daylight, but at high cost. It is thought that such artificial illumination might pay for itself when used for raising products temporarily of high value for special purposes.

**Agricultural tractors**, A. E. L. CHORLTON (*Engineering [London], 105 (1918), No. 2714, pp. 7–10, figs. 12; abs. in Sci. Abs., Sect. B—Elect. Engin., 21 (1918), No. 245, pp. 175–177*).—The work of an agricultural tractor is classified as road work, land work, and farmstead work. Considerable data bearing on these classifications are summarized and discussed.

The basic factors in road work are considered to be adhesion and resistance. Tests with steel and rubber tires on ordinary roads showed a maximum adhesion of 0.56 for steel and 0.6 for rubber tires. In designating a tractor for road work, it is concluded that the propulsive effort can not exceed 0.45 times the weight on the driving axle for steel tires and 0.5 for rubber tires. The data indicate (1) the desirability of providing enough engine power to permit the use of 4-share plows, (2) the value of a large flywheel effect to equalize the load, and (3) the advantage of using more efficient gearing. Fundamental values for the multipurpose tractor for English conditions are taken to be as follows: For road work, power requirement from 18 to 20 h. p., for land work 23 to 25 h. p., and for farmstead work 20 to 25 h. p. Other general features of design are discussed.

The principles of the wheeled farm tractor, E. R. Hewitt (*Gas Engine, 21 (1919), No. 6, pp. 182–185, figs. 3*).—The results of a large number of laboratory and field experiments are summarized.

A series of laboratory tests on full-sized wheels which checked very well with work on the machine in the open showed that "(1) the maximum drawbar pull is a definite function of the weight per inch of width. Weights used varied from 10 to 200 lbs. per inch; the ratio of maximum possible drawbar pull to total weight on the wheel was constant for that range. This was found to be true whether the ground were wet or dry. (2) On sandy ground the drawbar pull available with a smooth metal wheel is about 30 per cent of the weight on the wheel. (3) On damp, sandy ground the maximum drawbar pull is greater, being about 43 per cent of the weight, and under some conditions even slightly higher. (4) Cleats increase the maximum drawbar pull only in so far as the soil resists shearing; that is, the cleat carries a section of the top soil and slides it against the soil below the edge of the cleat.

"Experiments indicated that this was practically independent of the depth of the cleat, depending solely on the shearing strength of the soil at the depth of the cleat edge. In some cases the shallower cleat pulled more than the deeper cleat because the roots in the sod were not cut off and advantage was taken of their shearing strength." In going uphill it was found that a cleat inclined forward at an angle improved conditions somewhat, as the cleat entered the soil almost horizontally, acting like a step and tending to lift the weight off the wheel. "An inclination of about 30° was found to be the most satisfactory on a 6-ft. wheel. This arrangement tends to self-clean to a great extent. Setting the cleats at an angle of 30° to the axis of the wheel also helps this cleaning effect by slipping action. The shearing strength of the soils tested appeared to vary from 5 lbs. per inch of width in dry molding sand to 75 lbs. in loam or sod."

Studies of propelling power requirements on hard macadam road, dry short clover, long grass sod on gravelly loam, and dry plowed land, in which a cart with 46-in. wheels with 8-in. flat tires was towed by a motor truck, showed that the drawbar pull increased rapidly with the weight per inch of width on a regular curve on all but the hard macadam road, where the increase was only slight. "If a tractor has too great weight per inch of width of wheel and gets on soft ground, as it must do in harrowing, etc., the power consumed in rolling friction becomes a large percentage of the total developed and the drawbar pull is proportionately decreased. There is every advantage in increasing the surface and reducing the weight. Tractors with a weight of over 200 lbs. per inch of width of wheels that are even 6 ft. in diameter become very inefficient on soft ground."

"By using antifriction bearings, good lubrication, and cut gears of good design, it is possible to reduce the frictional losses from the engine to the rim of the rear wheels to less than 16 per cent of the total power developed. . . . It was found that on good sod with short grass the efficiency of the machine was about 75 per cent, i. e., the drawbar horsepower divided by the engine horsepower was 0.75. On plowed ground, harrowing, or cross plowing, it was about 65 per cent, and never fell below that figure."

Average data of several years' laboratory tests of fuel efficiency and gear changes with a number of engines indicate that for an ordinary engine the load should not go below 60 per cent for maximum fuel economy. "On the best ones under good conditions a fuel economy of 0.66 lb. per horsepower-hour can be obtained at 50 per cent load. Tractor engines should not be used below this point over long periods. Another point to be noted is the absolute necessity of

having the engine oiled and cooled so that it can run all the time at 50 per cent to full load, if we are to secure good fuel economy."

With reference to size of tractor, the author is not in favor of the small tractor as an economical investment but rather favors the use of horses for small farms instead. He is of the opinion that the machine should be as large as one man can operate easily and that can be run over roads, through gateways, and over bridges with 9 ft. overall width and 14,000 to 16,000 lbs. weight as the outside limits.

**Controlled tests of tractor labor**, E. RABATÉ (*Vie Agr. et Rurale, 8 (1918), No. 2, pp. 27–29*).—Plowing tests on light sandy and siliceous clay soils with eight tractor plowing outfits are reported. Test plats were 280 meters long by 40 meters wide. The tractors varied in power from 12 to 30 h. p. and in weight from about 2,800 to about 6,000 lbs. The plows consisted of from two to four bottoms.

The tests showed that better results were obtained with three plow bottoms than with two larger plow bottoms covering an equal width. The largest volume of soil was turned by a 20-h. p. tractor per unit of area plowed and per unit of fuel consumed. This outfit used a 3-bottom plow and worked to a depth of 19 cm. (7.5 in.). The next best results were given by two 16-h. p. tractors with 3 and 2-bottom plows, working to depths of 17.2 cm. and 18.5 cm., respectively. The most powerful tractor with a 4-bottom plow gave only medium results as regards fuel economy and volume of soil turned per unit area, but it stood second with reference to area plowed per hour.

**Traction on bad roads or land**, L. A. LEGROS (*Jour. Inst. Mech. Engin. [London], 1918, Nos. 3, II, pp. 55–158, pls. 40, figs. 54; 4, II, pp. 159–194; abs. in Sci. Abs., Sect. B—Elect. Engin., 21 (1918), No. 246, p. 211*).—This is a report of an extensive study and analysis of tractor and truck drives for hauling over roads and agricultural land.

With reference to the 4-wheel drive, it is concluded that "for the transport of goods over bad roads on gradients, varying from 1 in 15 on roads in which the tires sink 2 to 3 in. in depth to 1 in 5 on hard roads with bad surface, and for speeds varying from 1.5 miles per hour on grades to 12 miles per hour on fairly level roads, the 4-wheel drive tractor has great advantages over the ordinary 2-wheel drive tractor."

With reference to chain-track tractors, "it can be safely said that where a track can be found 7 ft. wide which does not present rocky obstacles over 10 in. high, whether over sand, ash, clay, marsh, snow, or ice, on the level, or on gradients up to 30 per cent, the chain-track tractor has proved itself capable of traveling and performing useful work beyond the capacity of animal haulage. For this reason the chain-track tractor may be expected to occupy a position of ever-increasing importance in the development of new countries, and in places where it is necessary to transport machinery and stores over roadless country many miles from the railway. . . .

"One featue that is particularly remarkable is the small amount of power lost in compressing soft marshy land under the feet of the track-chains. A very visible alteration of the appearance of a marshy surface due to the prints made by the track feet may, for example, only involve an expenditure of power which is but slightly greater than that required for hard ground, whereas the effort involved in walking over the same soft surface may be many times greater than that of walking on the hard road."

**Test of a disk pulverizer**, C. CLAROU (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 39 (1918), No. 15, pp. 343–350, figs. 3*).—Several tests of a disk harrow with six disks for vineyard cultivation are summarized briefly, the general trend of

opinion being that the implement promises to give good results. Traction tests showed that it required a greater tractive effort than the so-called vibrating or spring-toothed cultivator, and that the latter implement gave somewhat better results. It is thought that the disk harrow, while giving good results, is not entirely adapted for use on very heavy compact soils. Its traction requirements necessitate the use of two horses, which lowers its efficiency for vineyard cultivation.

**Tests of mechanical cultivating apparatus**, M. FERROUILLAT (*Vie Agr. et Rurale, 8 (1918), No. 40, pp. 251, 252*).—In connection with tests of a single 10-h. p. tractor on loose sandy vineyard soil, traction tests on a 3-bottom plow covering a width of about 30 in. and working at depths of from 5 to 6 in. showed a total average traction of from 221 to 322 kg. (487 to 708 lbs.). Tests of a double flexible toothed harrow covering a width of about 5 ft. and working at a depth of about 4 in. gave a total average traction of about 680 lbs. Other tests of special apparatus are noted.

**Recent advances in the differentiation of lactose-fermenting (gas-producing) bacilli, with special reference to the examination of water and food products**, D. R. WOOD (*Jour. Hyg. [Cambridge], 18 (1919), No. 1, pp. 46–58*).—Investigations are reported which confirm studies by American bacteriologists and show that lactose-fermenting or gas-producing bacilli can be divided into two main types, distinguishable by the methyl red and Vosges-Proskauer reactions.

The methyl red—Vosges-Proskauer+type were found to be rare in human and animal feces, more common in surface water, milk, and sewage, and the predominant type in soil and grain, and to be more resistant than the methyl red+ Vosges-Proskauer—type. The methyl red type was found to predominate in four out of six samples of soil.

Organisms of the methyl red type were found in 66 samples of water out of a total of 200 containing lactose fermenters, and in 41 samples containing this type no evidence of recent contamination could be found. Twenty-nine of the 66 samples were from water sources of good repute, mostly public supplies. It is concluded that judgment of the water was liable to modification by the recognition of this organism.

"The presence of lactose fermenters of the 'M. R.—' 'V. P.+' type must be regarded with considerably less disfavor than the presence of 'M. R.+' 'V. P.—' organisms, and the application of tests for the recognition of these types is important. It is suggested that these tests should be included in all routine examinations of water and food products."

**The deoxygenating effect of the effluent from the Miles acid process of sewage treatment**, F. W. MOHLMAN (*Engin. and Contract., 50 (1918), No. 7, pp. 166, 167, fig. 1; also in Jour. Indus. and Engin. Chem., 11 (1919), No. 4, pp. 325–327, fig. 1*).—Experiments with the Miles acid process of sewage treatment led to the conclusion that the acid effluent from this process contains unoxidized sulphur dioxid which is oxidized at the expense of the dissolved oxygen in the water in which the effluent is diluted.

"The sulphur doxid may be oxidized before dilution by aeration for a short time with relatively small quantities of air. After this aeration the effluent will not de-aerate large volumes of diluting water."

## RURAL ECONOMICS.

**Some after-the-war problems in agriculture**, G. F. WARREN (*Jour. Farm Econ., 1 (1919), No. 1, pp. 12–23*).—Problems of unemployment, police protection, education, labor, land ownership, food distribution, cooperation, equality

of opportunity, substitution, and dissemination of manufacturing are touched upon to show the farmer's need for organization.

**Economic questions**, A. COSTA (*Questões Economicas. Rio de Janeiro: Min. Agr., Indus., e Com., 1918, pp. X+374*).—This is a study of the principal crops, the live-stock industry, finance, transportation facilities, cost of living, foreign trade and tariff policy, and related phases of the economic development of Brazil.

**The appeal of the land**, J. H. RICARD (*L'Appel de la Terre. Paris: Payot & Co., 1919, pp. 399, pls. 8*).—In this volume are collected contributions by the author, under the pseudonym of François Leterrien, published in the *Paris Echo* weekly between December 7, 1915, and January 2, 1918. Topics touched upon in these essays include the rôle of associations and private initiative, agricultural labor, cultivation by motor power, the increased food supply, management for agriculture, Government responsibility and intervention, the return to the land, and others.

**The improvement of the Rhone and agriculture**, L. BERNARD (*Vie Agr. et Rurale, 9 (1919), No. 38, pp. 201–203, figs. 2*).—The advantages to French agriculture that would result from certain improvements for the development of navigation, water power, and irrigation along the Rhone, proposed by the interdepartmental commission and recently considered at a special congress held June 1 and 2, 1919, at Grenoble are discussed here.

**Give the land to the soldiers**, E. BURON (*Donnez des Terres aux Soldats. Paris: Éditions Bossard, 1919, pp. 188*).—The author cites examples of the opportunities offered by Great Britain for soldier settlements at home and in her oversea dominions. He reviews old and recent legislation of France intended to bring about the assembling of parcelled holdings, and describes various lands of France which are or might be made available for distribution to soldiers as well as the steps to be followed in offering them for settlement.

**The after-war settlement and employment of ex-service men in the oversea dominions**, H. R. HAGGARD (*London: The Saint Catherine Press, 1916, pp. 68*).—This is the report of the author to the Royal Colonial Institute of a tour of England's oversea dominions, made early in 1916, to ascertain the facilities the various governments were prepared to give as regards land settlement and employment to British ex-service men who might wish to settle in them after the war.

**Employment and natural resources**, B. MACKAYE (*Washington: U. S. Dept. Labor, 1919, pp. 144, pls. 10, figs. 10*).—This is a consideration of possibilities of providing alternative and permanent employment on agricultural and forest lands of the United States. The original, actual, and potential utilization of the territory of the United States is geographically outlined, and the salient principles determining the success of land utilization by returned soldiers and the methods of applying them on agricultural and forest lands are discussed in detail. Principles applying to the use of agricultural soil relate to community cooperation, reclamation, ready-made farms, credit, limitation of farm areas, and land tenure.

Australian and other systems of land settlement are described, and Australian land legislation is frequently referred to as advanced and as having been developed to meet conditions similar to those on the American Continent. The question of payment charged for the use of land is taken up on the basis of the income to be derived from the farming industry.

**The farm labor outlook for 1919**, G. I. CHRISTIE (*Jour. Farm Econ., 1 (1919), No. 1, pp. 8–11*).—A forecast of the probable 1919 crop acreage, the demobilization of men from the Army, return of laborers from war manufacturing plants to the farm, demands for labor on public works, etc., is briefly considered.

**The work of the agricultural wages board in 1918**, A. W. ASHBY (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 138–156*).—In these pages the work of the District Wages Committees and orders issued by the Agricultural Wages Board in England and Wales in 1918 are reported. In an appendix the minimum rates of wages in force March 1, 1918, are tabulated by counties, ages of workers, etc.

**American negro slavery**, U. B. PHILLIPS (*New York and London: D. Appleton & Co., 1918, pp. XI+529, pl. 1*).—This is a survey of the supply, employment, and control of negro labor as determined by the plantation régime, taken from historical and documentary sources, and from contemporary records of slaves, masters, and witnesses. The chapters included are the discovery and exploitation of Guinea, the maritime slave trade, the sugar islands, the tobacco colonies, the rice coast, the northern colonies, revolution and reaction, the closing of the African slave trade, the introduction of cotton and sugar, the westward movement, the domestic slave trade, the cotton régime, types of large plantations, plantation management, plantation labor, plantation life, plantation tendencies, economic views of slavery—a survey of the literature, business aspects of slavery, town slaves, free negroes, slave crime, and the force of the law.

**Child-caring work in rural communities**, H. I. CURRY (*U. S. Dept. Labor, Children's Bur. Pub. 60 (1919), pp. 363–367*).—In this address before the Children's Bureau Conferences in May and June, 1919, it is stated that the county is probably the best administrative unit for rural organization, but that a State-wide agency should be established for the placing out of children and possibly for other specialized work. The needs of rural communities for nursing and social service are discussed.

**Rural population**, E. A. GOLDENWEISER (*U. S. Dept. Agr., Atlas Amer. Agr., pt. 9, Sect. 1 (1919), pp. 19, figs. 38*).—This publication consists of graphs and maps of the United States with explanatory notes showing the geographic distribution and relative importance of urban and village population, the native white, foreign white, and negro stock of rural population, the proportion not attending school, illiteracy in the rural population, country of origin of foreign population, the rural population unable to speak English, and the increases and decreases in country population. This study also shows by State and county the country population in 1910 and 1900. The whole is based upon census figures for 1910. A list of selected references on rural population is given.

**On absenteeism**, G. F. DE LA ROSA (*Bol. Agr. Téc. y Econ., 10 (1918), Nos. 118, pp. 870–878; 119, pp. 939–947; 120, pp. 1068–1078*).—A discussion of the development and evils of, and the means of discouraging, absentee landlordism and the depopulation of rural districts of Spain.

**A survey of the development of the Serbian (Southern Slav) Nation**, G. DIOURITCH (*Jour. Roy. Statis. Soc., 82 (1919), No. 3, pp. 293–342*).—There is here published an address delivered before the Royal Statistical Society, on March 18, 1919, which is an economic and statistical study of the population; the land under cultivation; the foreign trade, particularly in foodstuffs; the mineral wealth; means of communication; and currency, banking, revenue, and public expenditure of Serbia, Serbian territories liberated in 1912, and Southern Slav peoples under the domination of Austria-Hungary.

It is shown that, in 1905, 87.37 per cent of the population of Serbia were agriculturalists; that 91.59 per cent of the 401,093 families in 1900 were proprietors; and that the area cultivated, especially plowed land, had increased considerably to the detriment of commons, grasslands, and forests. It is stated that the occupation of the people is even more exclusively agricultural

in the territory liberated from Turkey than in Serbia itself. Comparisons made illustrate the economic retardation resulting from Turkish domination and Austro-Hungarian economic control. The author outlines the means adopted by Austria-Hungary to exploit Southern Slav territory as a field for absorption of German and Austrian industrial production; also the Serbian losses in the war.

**A study of agricultural colonization**, D. TARUFFI (*Ist. Agr. Colon. Ital., Relaz. e Monog. Agr. Colon., No. 5 (1915), pp. VII+268*).—A detailed study is made of agricultural colonization programs at home and abroad followed by various European and non-European countries, also land-holding systems, encouragement of intensive cultivation, and other general problems connected with organization.

**Jewish agricultural colonization in Palestine** (*Internatl. Inst. Agr. [Rome], Internatl. Rev. Agr. Econ., 10 (1919), No. 4, pp. 206–222*).—A brief account of natural and economic conditions of the country and systems of land-holding, notes on the history of Jewish colonization in Palestine, and a report on the work of several colonizing companies through a period of years are given here.

**[Onion growers' association and small holdings in Montserrat]**, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Montserrat, 1917–18, pp. 30–34*).—These pages contain a report on the activity of the Montserrat Onion Growers' Association, notes on the boom in the sea island cotton and lime industries, and information showing the number of cultivators of small holdings.

**Regulations of the Secretary of Agriculture under the United States Warehouse Act of August 11, 1916, as amended July 24, 1919.—Regulations for grain warehouses** (*U. S. Dept. Agr., Off. Sec. Circ. 141 (1919), pp. 46*).—The rules and regulations for grain warehouses promulgated September 9, 1919, are presented. The amended text of the act (E. S. R., 38, p. 895) is included.

**Suggestions regarding fall-sown crops, with notes on the live-stock situation, September, 1919** (*U. S. Dept. Agr., Off. Sec. Circ. 142 (1919), pp. 27, fig. 1*).—This is a study of the agricultural situation in this country and abroad and of the probable foreign trade of the United States with reference to fall-sown grains and to live stock.

In reviewing European wheat and rye requirements for 1919–20, reports by representatives of the U. S. Grain Corporation and of the U. S. Department of Agriculture who visited the principal countries of western and central Europe the past summer are noted, but the discussion is based principally upon data published by the International Institute of Agriculture. It is concluded that, assuming that monetary exchange rates will not be prohibitive, it seems probable that Europe will draw upon Canada, the United States, Argentina, and Australia to supply its cereal import requirements, as the four countries named are the only ones which have surpluses worth considering, and that apparently the United States will be justified in undertaking to produce an exportable surplus in 1920 of about 200,000,000 bu.

Study is made of the acreage sown, production, consumption, and exports for the last five years of the United States wheat crops, and of the acreage sown to winter wheat in each State for the crops of 1915 to 1919, inclusive, with the five-year average. The figures in the latter case show where the greatest expansion in wheat acreage was made in the last few years, and where growers should consider most seriously the question of readjustment of wheat acreage. The rye crops of the United States are shown in a similar way. Suggestions for preventing grain diseases, fall seeding of meadows and pastures, and restoring crop rotations which may have been interrupted by the

demand for increased grain crops during the War, and brief reports on the conditions of such winter-grown truck crops as potatoes, onions, and cabbage are given.

The figures given for the trend of factory production of dairy products indicate that between 1914 and 1918 the production of cheese decreased 25,000,000 lbs., and the condensed milk production doubled, it having increased from 875,000,000 lbs. to 1,675,000,000 lbs. With the latter increase has gone a considerable increase in our export of these products and it is predicted that, to supply their needs, the countries of Europe probably will continue to import dairy products, at least for a time. A chart illustrates the balance of trade in dairy products.

Tables give the number of cattle, hogs, and sheep before the war and in either 1918 or 1919 in 14 of the most important countries engaged in the international trade (imports and exports) in meat and meat products prior to the war, not taking into consideration the number of animals in what constituted the former Empires of Austria-Hungary and Russia or in the Balkan States, for which it has not been possible to obtain recent figures, also the number of pounds of beef, pork, mutton, and goat meat produced in this country, as estimated from the slaughter of animals for the past six calendar years and for the first six months (January to June, inclusive) of 1918 and 1919. It is estimated that during the five years before the war exports of meat and meat products from the United States averaged about 1,100,000,000 lbs. annually, of which pork and pork products constituted about 81 per cent. During 1915, 1916, and 1917 the average annual exports rose to above 1,800,000,000 lbs., of which pork and pork products constituted 76 per cent. In 1918 the exports of meat and meat products rose to 3,058,000,000 lbs., of which pork and pork products constituted 74 per cent. During the first six months of 1919 the export of meat and meat products amounted to 1,957,600,000 lbs., or 15 per cent more than during the first six months of 1918. Of this amount pork and pork products constituted 88 per cent. The conclusion is that our exports of meat will undoubtedly decrease somewhat in the future, but that the bulk of European imports of pork must continue to come from the United States.

**Crop cycles in the United Kingdom and in the United States**, H. L. Moore (*Jour. Roy. Statis. Soc., 82 (1919), No. 3, pp. 373–389, figs. 8*).—This paper presents the methods employed in ascertaining the existence of periodicities which furnish evidence that the yield of the leading cereal crops in the United Kingdom tends to vary in well-defined cycles, and that, as far as the statistics of the two countries are comparable, the crop cycles in the United States tend to synchronize with those of the United Kingdom.

Crude figures for the yield per acre of wheat, barley, and oats from 1884 to 1914 in the United Kingdom, exclusive of the Isle of Man and Channel Islands, were converted into index numbers of which the base was the mean yield for the 10 years, 1890 to 1899. The curves platted and periodograms constructed are shown. In all cases the principal maxima are nearly at 1890, 1898, 1906, and 1914, and the secondary maxima are about midway between these years.

Study of the periodicity of rainfall in the Ohio and Mississippi River Basins, 1839 to 1910; the yield per acre of cotton in the United States, 1882 to 1914; and of crops of corn, wheat, barley, rye, buckwheat, potatoes, hay, and cotton in the United States gives finally 8-year cycles in which the maxima occur at about the same dates as those of the crops in the United Kingdom.

**Returns of produce of crops in England and Wales with summaries for the United Kingdom** (*Bd. Agr. and Fisheries [London], Agr. Statis., 52 (1917), No. 2, pp. 37–58; 53 (1918), No. 2, pp. 33–56*).—These reports continue information previously noted (E. S. R., 37, p. 392).

**[Agricultural statistics of France]** (*Ann. Statis. [France], 35 (1916–1918), pp. 209–232*).—Summary tables are given showing the areas sown and yields of wheat, rye, oats, barley, corn, potatoes, vines, rice, and cotton, and the numbers of live stock in France and in foreign countries during the period 1850–1918.

**Russia: Its trade and commerce**, edited by A. RAFFALOVICH (*London: P. S. King & Son, Ltd., 1918, pp. IX+461*).—Chapters on agriculture by J. J. Pelferoff, on poultry farming and fodder grass, and on the cultivation of cotton, flax, hemp, sugar beet, tobacco, wine, hops, and fruit by N. Malahovsky and A. Isenberg give statistics of production and exports of principal crops and live stock in Russia in the first 15 years of the twentieth century, with brief notes on land tenure and the development of the various agricultural industries and regions in which they are important. Mining and other industries are described, and discussions of internal transport trade, foreign trade, public finance by M. Bogolepoff, and money and credit are also included.

**Agricultural and pastoral South Africa**, F. D. MACDERMOTT (*So. African Jour. Indus., 2 (1919), Nos. 5, pp. 419–435; 6, pp. 505–518*).—The general cultural conditions in the different Provinces of the Union of South Africa are described. It is concluded that this region is preeminently a stock-raising country, that the weak spot in the agricultural outlook is that of the supply of breadstuffs, and that opportunities for further development lie in the production of mealies or maize, the cultivation of vineyards and citrus fruits, the production of wool and mohair, cotton and other fibers, and tobacco, and in the dairy industry. The commercial organization of the farm industries of the Union and the encouragement of land settlement are urged.

**Present agricultural problems and colonization in Algeria**, G. J. STOTZ (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 39 (1918), No. 34, pp. 181–186*).—Concluding the study previously noted (E. S. R., 40, p. 487), the author urges concentration of effort by European colonists upon the better land of the country, and organization for supplying capital, buying and selling, transportation, agricultural research, and education. A table is given showing the population, total area, and total productive area, also the production of crops and live stock per area in Australia, Argentina, Canada, the United States, and Algeria.

**Estimates of area and yield of principal crops in India, 1916–1918** (*Dept. Statis., India, Est. Area and Yield Princ. Crops India, 1916–17, pp. 2–28; 1917–18, pp. 5–30*).—Information previously noted (E. S. R., 39, p. 595) is continued for the later years.

## AGRICULTURAL EDUCATION.

**Memorandum on the reconstruction of agricultural education in England and Wales**, W. SOMERVILLE, P. H. FOULKES, and C. CROWTHER (*Newport, Salop, England: Agr. Ed. Assoc. [1919], pp. 64*).—In this memorandum the Agricultural Education Association of England formulates its views on agricultural education and research.

As regards elementary agricultural education and county work, it is recommended that a dividing line be drawn at the age of 16, the aim of continuation school education up to this age being the improvement of general education with English, arithmetic, and rural science as the essential subjects (with the addition of handicraft or gardening for boys, and domestic science, dressmaking, or dairy work for girls). After that age specific agricultural education courses should be provided for those who propose to stay on the farm. Two-year classes devoted primarily to practical agriculture and horticulture (with a limitation of the centralization of such instruction) should be provided locally for those willing and able to carry their education beyond the continua-

tion school age. Thereafter students fitted for higher instruction should be encouraged by scholarships or otherwise to proceed to a farm institute or possibly, in cases of outstanding ability, direct to the higher college. It is further recommended that provision be made for instruction in the best methods of performing the more highly skilled operations of the farm and allied work, that lectures and short courses to farmers, gardeners, and others, as well as field demonstration work, should be continued and extended, and that county educational staffs should be considerably augmented.

It is desired by the association that relatively short courses (with a standard course of between one and two years) be provided at farm institutes, and longer courses of not less than two years at the agricultural colleges. It is suggested that at the farm institute sound practical instruction should be the basis, while the 2-year (certificate) and 3-year (diploma) courses at the college would give a sound knowledge of the scientific principles underlying the practice and economics of agriculture and allied industries. The provision of scholarships tenable at the farm institutes is recommended to enable the more able students to pass to the college or university for more advanced courses. A farm suitable for teaching purposes is recommended for the farm institute. The farm at the college, in addition to serving for educational purposes, should be utilized as a central experimental farm for the Province.

The association is of the opinion that the university should be relieved of the duty of providing courses of a lower than university standard; further, that while a degree course based primarily on the history and economics of agriculture and the development of rural law and local institutions might serve better the needs of the working farmer taking a university course for its general educational rather than its technical value, the number of such students in attendance at present (except perhaps at the older universities) is not sufficient to warrant any radical departure from the existing type course based primarily on science. For students intending to go out as specialists in one of the sciences bearing on agriculture, it is recommended that an honors degree course in pure science should be followed by a post-graduate course in agriculture and agricultural science. The necessity for adequate facilities for research on the part of the university teaching staffs is emphasized, and it is insisted that the demands of administrative duties should not encroach unduly upon the time available for teaching and research.

As regards agricultural research, while increased financial provision is needed as the work develops, the present problem is considered the provision of trained men rather than of means. The organization of a definite research service is suggested, which would guarantee a satisfactory career and thus attract and retain the best men. The establishment of a national agricultural research committee to survey periodically the whole field of research and organize cooperative work on important problems, it is suggested, might be productive of great good.

The association qualifies farms for purposes of agricultural education as follows: Central experimental farms, attached to a research station and used entirely for purposes of experiment and research; institutional farms attached to a university, college, or other teaching institution and used partly for teaching purposes and partly for experiment; county experimental and demonstration farms, used for the duplication under different conditions of experiments carried out at the two preceding types of farms, and for the local demonstration of new crops, improved varieties, etc.; and illustration farms, run on strictly commercial lines, and intended to demonstrate in a given locality the possibilities of the system of farming deemed by the local advisory authority to be the best for the area in question.

Attention is called to the great lack of well-trained teachers, advisers, and experts in dairying. The association criticizes the concentration of dairy education in the past on cheese and butter making, and points out that more attention should be paid to the production and management of milk for direct human consumption. It holds that horticulture can not be regarded as simply a branch of agriculture, and that the problem of the provision of horticultural education must hereafter be regarded as largely separate from that of the provision of agricultural education. It is found that more prominence should be given to poultry education in the curricula of colleges and farm institutes, and that the county work should be closely coordinated with it. A course of at least two years' duration preparing candidates for a national diploma in poultry keeping, or a poultry manager's certificate should be provided by the college, while the farm institute should provide shorter courses qualifying for a poultry worker's certificate. Special provision for research and experimental work in the subject is urgently needed.

**The reconstruction of agricultural education** (*Jour. Bd. Agr. [London], 26 (1919), No. 3, pp. 300–304*).—Extracts are given from the summary of recommendations in the memorandum noted above.

**Allotments under the Agricultural Instruction Act** (*Agr. Gaz. Canada, 6 (1919), No. 10, pp. 865–869*).—A brief summary is given of the purpose for which the grants for 1919–20, made under the Canadian Agricultural Instruction Act, are to be expended, together with statements of the appropriation to each Province. The total allotment of $1,100,000 includes $291,701.16 for agricultural colleges and schools, $597,712.68 for instruction and demonstration, $31,510 for women's work, $154,076.16 for elementary agricultural education, and $25,000 for veterinary colleges.

**Government assistance to fairs and exhibitions** (*Agr. Gaz. Canada, 6 (1919), No. 9, pp. 816–821*).—This is a series of articles dealing with government grants to fairs and exhibitions and the purposes for which they are expended in the Provinces of Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia.

**Vocational education [in New Brunswick]**, F. Peacock (*Agr. Gaz. Canada, 6 (1919), No. 8, pp. 752, 753*).—Steps taken under the vocational education act passed by the New Brunswick legislature in 1918 (E. S. R., 41, p. 195) are described. The policy of the board was to open only a few type vocational schools and departments during the first year, including a full-time county vocational school at Woodstock operating departments of agriculture, homemaking, commercial work, and motor mechanics.

**[Extension teaching in farm management]** (*Jour. Farm Econ., 1 (1919), No. 2, pp. 44–73*).—The following papers read at the American Farm Management Association meeting in January, 1919, are included; Farm Management Demonstrations in New York State, 1919: A Demonstration for the Sixth Year; Income Tax and Farm Management; Demonstration Work on Cost of Production Records in Nebraska; Assistance Given in Summarizing Farm Records in Indiana; Farm Management Extension Work; Getting Farm Management to the Farmer; Teaching Farm Management Through Farm Accounting; Farm Management Demonstrations—Past, Present, and Future; Constructive Criticism of Extension and Demonstration Work in Farm Management; and Relationships Between Extension and Investigation Work in Farm Management. In these papers special attention is given to methods of teaching farm management, particularly in relation to the business of the farm and the farmer. Many historical facts concerning the development of farm management demonstrations, as well as suggestions with reference to the improvement of the present program, are included.

**Elementary chemistry of agriculture**, S. A. WOODHEAD (*London: Macmillan & Co., Ltd., 1919, pp. VII+188, figs. 47*).—This text deals with elementary principles and laboratory tests, the beginnings and development of a chemistry of agriculture, plants, soils, fertilizers, farm foods, milk and its products, and insecticides and fungicides. Each chapter begins with suggested experiments and is followed by review questions.

**What is the value of the usual laboratory work given in general soils courses?** P. E. KARRAKER (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 253–256*).—It is the purpose of this paper "to express doubt as to the justifiable value to the students of the usual laboratory work in first or general soils courses as compared with other work which might be taken. In particular, it is desired to raise the question whether it would not be advisable to give this work as separate courses, thus giving opportunity for the securing of the subject matter without the laboratory work and requiring the latter only of men desiring to specialize in soils or closely related work."

**Nature study and elementary agriculture** (*Agr. Gaz. Canada, 6 (1919), No. 9, pp. 836–839*).—This is a series of brief articles dealing with nature study and elementary agriculture in the Provinces of Nova Scotia, New Brunswick, Saskatchewan, and Alberta.

In Nova Scotia nature study and elementary agriculture are not separated, agriculture being taught through nature study. In New Brunswick the subjects are combined in a nature study and agriculture course prescribed by the Board of Education. Schools are not obliged to have school gardens or home plats, but the Department of Agriculture offers grants for their establishment.

The course of study for the schools of Saskatchewan includes a course in nature study for grades one to six, and in agriculture for grades seven and eight. In the high schools and collegiate institutes the work is continued under the head of elementary science for the first two years and is compulsory, but in the third year it is known as agriculture and is an optional subject.

Under the Alberta organization nature study belongs characteristically to the first six grades of the common school, and may be said to persist as a method in the laboratory teaching of grades seven and eight. In the latter grades it is termed agriculture, and includes a knowledge of the essential laws and principles concretely established and understood.

**The elements of animal biology**, S. J. HOLMES (*Philadelphia: P. Blakiston's Son & Co., 1919, pp. X+402, figs. 250*).—This text, which is intended as an introduction to the elements of animal biology for the use of high-school students, comprises three parts, viz, the animal kingdom, consisting of a survey of the principal groups of animals; the elements of physiology, including chapters on the rôle of bacteria in causing disease, how diseases spread, and how they may be avoided; and general features and adaptations, such as evolution, heredity, eugenics, etc.

**Practical guide to agricultural home economics instruction**, L. ROUGIER, C. PERRET, and H. ASTIER (*Guide Pratique de l'Enseignement Ménager Agricole. Paris: J. B. Baillière & Sons, 1913, pp. 228, figs. 172*).—This book, which is designed especially for girls in rural districts, consists of two parts dealing, respectively, with the woman in the home and the woman on the farm. Part 1 includes chapters on the house, its furnishings, heating and lighting, and care; cooking; laundering; sewing; hygiene; prevention of disease; and care of the sick and of children. In part 2 chapters are devoted to the dairy cow; milk; butter and cheese; the utilization of by-products of milk, and the piggery; breeds of chickens and egg production; raising chicks, diseases; other fowls and rabbits; bees; the farm garden; and household accounts. Each chapter closes with review questions, problems, and references to literature.

**Food saving and sharing**, E. M. TAPPAN ET AL. (*Garden City, N. Y.: Doubleday, Page & Co., 1918, pp. X+102, figs. 13*).—This book, prepared under the direction of the U. S. Food Administration in cooperation with the U. S. Department of Agriculture and the U. S. Bureau of Education, gives instruction on the wise selection of the different kinds of foods for their value in giving health and strength and in saving and sharing, and tells what this country did to provide food during the war and what is yet to be done.

**Sewing and textiles**, A. TURNER (*New York and London: D. Appleton & Co., 1918, pp. [5]+246, figs. 64*).—This text for graded and rural schools is designed especially for teachers who have had little training and experience. It contains detailed directions for making the various stitches, a needle book, a sewing book, garments, darning and patching, embroidery and fine needle work, the use of commercial patterns and principles of cutting and fitting, and the use and care of the sewing machine; studies of cotton, woolen, linen, and silk materials, including the evolution of weaving and spinning, history, growth and manufacture, properties of fiber, finish, judging and testing for quality, comparison of wearing qualities with price, etc.; laundry problems; and clothing—hygiene, functions, and budget. The material is arranged in sequence.

**R U S: Rural uplook service**, compiled by L. H. BAILEY (*Ithaca, N. Y.: Author, 1918, pp. 313*).—This register of 2,746 entries is described as "a preliminary attempt to register the rural leadership in the United States and Canada." It constitutes a rural Who's Who, and is based on replies received to requests sent out to 7,061 persons "regularly and prominently engaged in rural work as farmers, teachers, investigators, business men, ministers, lecturers, farm agents, authors, editors, rural organizers, administrators, if their efforts are such as to make them public characters."

## MISCELLANEOUS.

**Report of the Hettinger substation for the years 1913 to 1918, inclusive** (*North Dakota Sta. Bul. 130 (1919), pp. 3–56, figs. 6*).—This bulletin consists of reports for this substation for the years 1913 to 1918. The experimental data recorded are for the most part abstracted elsewhere in this issue.

**Monthly bulletins of the Western Washington substation** (*Washington Sta., West Wash. Sta. Mo. Bul., 7 (1919), Nos. 6, pp. 86–100, figs. 4; 7, pp. 102–116, fig. 1; 8, pp. 118–132, fig. 1*).—These numbers contain two articles abstracted elsewhere in this issue, and brief articles as follows:

No. 6.—Future of Small Fruit Growing in Western Washington, by J. L. Stahl; Variations in Milk and Cream Tests, by L. E. Carter; Farm Crops for Fall Seeding, by E. B. Stookey; Sorting and Moving Flocks, by G. R. Shoup; Late Blight of Potatoes, by A. Frank; and Egg-laying Contest.

No. 7.—Summary of Small Fruits, by J. L. Stahl; Work of the Veterinary Department, by W. T. Johnson; What is Skim Milk Worth to the Farmer? by L. E. Carter; Potato Wart—A Dangerous Disease, by A. Frank; and Western Washington Egg-laying Contest.

No. 8.—Strawberries in Western Washington, by J. L. Stahl; How Can We Increase Crop Yields? by E. B. Stookey; Abnormal Milk and Cream, by L. E. Carter; Animal Proteins; A Controlling Factor in Egg Production, by G. R. Shoup; Poultry Mortality, by W. T. Johnson; Controlling Mountain Beavers, and Farmers' Winter School.

**The history of the Agricultural Society of South Carolina**, C. I. WALKER (*Charleston: Agr. Soc., S. C. [1919], pp. IX+168, pls. 15*).—An account is given of the establishment and accomplishments of this society, organized at Charleston, S. C., August 24, 1785.

# NOTES.

**Arkansas University and Station.**—Dr. Bradford Knapp, chief of extension work in the South, States Relations Service, U. S. Department of Agriculture, since 1911, has been appointed dean of the college of agriculture, director of the station, and chief of the department of rural economics. Martin Nelson has been appointed vice dean and vice director and chief of the department of agronomy.

**California University.**—A number of changes have been made in the plan of instruction of regular students in the college of agriculture, effective with the opening of 1920. Under the new plan fewer subjects will be required of all students, opportunity will be given for some work in agriculture each semester, and a closer relation will be established between the subject matter in the fundamental sciences and in agriculture. Among other changes, three new courses dealing in a broad way with general principles, one each in agronomy, animal husbandry, and horticulture have been added as electives. There will also be a new required course in botony, strongly emphasizing plant physiology, and changes will be made in the subject matter of the courses in zoology, agronomy, animal husbandry, and horticulture.

**Georgia College and Station.**—From practically no students ten years ago the college of agriculture has become the largest department of the university, with an enrollment of 450 long course students and a number in short courses.

A very successful tractor demonstration was held at the college November 5, 1919, under the auspices of the farm bureau of Clarke County. A boll weevil school is to be held January 20 to 30, comprising demonstrations of methods to fight the boll weevil.

T. E. Keitt has resigned as chemist and agronomist of the station, effective January 1.

**Hawaii Federal Station.**—C. W. Carpenter resigned as pathologist November 15, 1919, to become associate pathologist in the Hawaiian Sugar Planters'. Station, where it is expected that he will continue his investigations on root rot diseases. J. E. Higgins, horticulturist, resigned December 25 to become professor of agronomy in the college of agriculture of the University of the Philippines.

**Idaho University and Station.**—Dr. W. M. Gibbs of the University of Wisconsin has been appointed professor of bacteriology and bacteriologist. C. H. Werkman has been appointed research assistant in bacteriology, and Ray F. Morgan instructor in dairy husbandry.

**Kansas College.**—Arrangements are being made for two 10-day short courses to be held in March, one in grain elevator accounting in cooperation with the Bureau of Markets, U. S. Department of Agriculture, and the other in grain marketing. C. W. Mullen, assistant professor of crops, has resigned to engage in agricultural journalism, and has been succeeded by J. W. Zahnley of the department of education.

**Kentucky Station.**—William Rodes, chemist, and A. E. Ewan, superintendent of experimental fields, resigned December 11 and December 13, 1919, respectively. The latter has been succeeded by S. C. Jones.

**Louisiana Stations.**—W. R. Dodson, dean of the college of agriculture since 1909 and director of the stations since 1905, resigned January 1. He was succeeded by Dr. W. H. Dalrymple, who will also continue as professor of veterinary science and veterinarian.

**Maryland Station.**—Howard J. Winant has been appointed assistant in soil investigations.

**Massachusetts Station.**—Miss Esther S. Mixer, assistant chemist in the feed and dairy section, has resigned to accept a position in the Pennsylvania College, and has been succeeded by Miss Ethel M. Bradley.

**Minnesota University and Station.**—A contract has been entered into with the Anoka County Poor Farm for the use, by the station, of a portion of its land as a sandy-land experiment field. This tract adjoins one already in use as a peat-land experiment field, and a series of mutually contributory and complementary soil studies on the two types has been inaugurated.

The official testing of pure-bred cows for advanced registry has increased until 60 testers are now in the field.

The resignations are noted of R. M. Washburn as professor of dairy husbandry to engage in commercial work; F. W. Peck, as associate professor of farm management, who has been for several months connected with the farm cost-accounting studies of the Office of Farm Management, United States Department of Agriculture; and Benjamin Kienholz as instructor in agronomy. J. D. Black has been appointed professor and chief of the division of agricultural economics, vice W. W. Cumberland, whose leave of absence for service in Turkey as financial and economic adviser to the commission to negotiate peace between the Allies and Turkey has been continued for another year. J. R. Keithley, head of the dairy department of the North Dakota Station, has been appointed professor of dairy manufactures; Theodore Odland, instructor in agronomy and assistant agronomist; George A. Pond, assistant professor of farm management; C. G. Worsham, instructor in farm management; and D. L. Peterson, instructor in poultry husbandry.

**Missouri University and Station.**—The resignations are noted of T. J. Talbert as associate professor of horticulture; Ernest C. Pegg as assistant professor of forestry; Ralph L. Mason as extension instructor in poultry husbandry; and J. C. Hackleman as extension assistant professor of farm crops, the last named to assume charge of crops extension work at the University of Illinois. A. C. Dahlberg has been appointed assistant professor of dairy husbandry.

**Nebraska University and Station.**—Dr. E. M. Wilcox, plant pathologist and physiologist, has resigned, effective April 1, to become director of an experiment station to be established in San Domingo.

**Nevada University and Station.**—Dean C. S. Knight of the college of agriculture, also head of the department of agronomy in the college and station, has resigned to become secretary of the Reno Chamber of Commerce, effective June 30. Miss Hester Mayotte, secretary and librarian of the station, resigned January 31.

**New Jersey College and Stations.**—Arrangements have been made with the French Ministry of Agriculture for tests by the stations of eight lots of soil from the territory in the vicinity of Verdun, Rheims, Soissons, and Amiens. A comparison will be made of soil from fields not affected by shell fire with soil from fields badly torn by shells and shell fragments, with a view to determining whether the churning of the surface by shells and the temporary saturation with gas fumes has more or less permanently affected the crop-producing power of the land.

William Rudolfs, of Wageningen, Holland, a graduate student in soils at the State Station, is to spend the greater part of the year in the Pasteur Institute in France, putting on a commercial basis the practice which has already been worked out in the laboratories for making rock phosphate available by the process of sulfofication. Howard F. Huber has resigned as assistant State leader of farm demonstration to go into commercial work, and has been succeeded by W. F. Knowles, formerly assistant State leader in boys' and girls' club work.

**New Mexico College and Station.**—President A. D. Crile and Joseph W. Rigney, assistant horticulturist, have resigned. The latter is to engage in farming, and has been succeeded by Sidney W. Wentworth.

A large live-stock dipping vat has been built on the college grounds for the use of farmers and stockmen at a small cost per head.

**Pennsylvania College and Station.**—A. L. Patrick has been appointed assistant professor of soil technology.

**Rhode Island Station.**—C. G. Bridge, assistant chemist, has resigned. Bertha M. Heath has been appointed assistant in animal breeding and pathology.

**Tennessee University and Station.**—Litigation extending over five years has been terminated by a compromise under which a bequest by the late B. R. Strong of $65,000 and certain real estate to the university has been agreed to. Of this amount $35,000 is to be used for farm purposes by the college of agriculture.

The cornerstone of the new agricultural building was laid November 1, 1919, and it is expected that the building will be ready for occupancy by the opening of the fall term. The cost will be approximately $250,000.

S. H. Essary, associate professor of botany and mycologist of the station, has been appointed botanist.

**Vermont University and Station.**—An industrial fellowship has been established in the college of agriculture by the soil improvement committee of the National Fertilizer Association. The fellowship will provide $1,500 per annum for three years for research in the station on the relation of fertilizers to the hastening of crop maturity. Lewis H. Flint, instructor in botany, has been designated for the fellowship.

Dr. A. K. Petersen, assistant professor of botany and botanist, has been appointed professor of botany and botanist in the Colorado College and Station.

**Virginia College and Station.**—The total enrollment of students is 789, the largest attendance in the history of the college.

M. E. Gardner has been appointed assistant horticulturist; E. R. Hodgson, superintendent of the Staunton County substation, vice R. H. Cook; and R. C. Thomas, formerly assistant botanist at the Ohio Station, assistant plant pathologist.

**Washington College and Station.**—Roy Larsen has been appointed assistant in horticulture in the station to investigate soil and cover crop management in the orchards of Chelan County, with headquarters at Wenatchee, beginning February 15. An appropriation of $4,300 for the first year's work has been granted by the county commissioners.

The appointment is also noted of C. L. Vincent as instructor in horticulture, beginning January 5, vice E. S. Robertson, who will become extension specialist in horticulture.

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NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective State experiment stations; "Alaska," "Guam," "Hawaii," and "Porto Rico," to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can.," to those of the experiment stations in Canada; and "U.S.D.A.," to those of this Department.

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